

Iconicity in Language and Literature 8

From Interaction to Symbol

*A systems view
of the evolution of signs and communication*

Piotr Sadowski

John Benjamins Publishing Company

From Interaction to Symbol

Iconicity in Language and Literature

A multidisciplinary book series which aims to provide evidence for the pervasive presence of iconicity as a cognitive process in all forms of verbal communication. Iconicity, i.e. form miming meaning and/or form miming form, is an inherently interdisciplinary phenomenon, involving linguistic and textual aspects and linking them to visual and acoustic features. The focus of the series is on the discovery of iconicity in all circumstances in which language is created, ranging from language acquisition, the development of Pidgins and Creoles, processes of language change, to translation and the more literary uses of language.

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Volume 8

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and communication

by Piotr Sadowski

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For Tanya and Adaś

There is an anaesthetic of familiarity, a sedative of
ordinariness, which dulls the senses and hides
the wonder of existence

Richard Dawkins

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I affectionately dedicate my book to my younger son Adaś and his wife Tanya, wishing them a happy life together and plenty of satisfaction from their own academic pursuits.

Preface

To say that we are constantly bombarded by sensory stimuli, and that to be able to receive stimuli, make sense of them and respond to them is tantamount to being alive, is more or less stating the obvious. But as the biologist Richard Dawkins has perceptively noted in the sentence I chose for the motto of my book (Dawkins 2006c: 6), we tend to ignore the obvious out of habituation and over-familiarity, often forgetting that trying to explain what seems obvious can reveal a wonderful and intricate physical and biological design, which we overlook precisely because it works so well. Both the sensory apparatus that receives inputs and the nervous system that processes and interprets them play a crucial role in the survival of all living creatures, from single-celled organisms to complex human beings, by enabling them to communicate with one another and to negotiate their living environment when searching for food and mating opportunities, or when protecting their bodies against injuries and death. For example, fireflies communicate by means of blinking lights, crickets rub legs or wing cases together to send characteristic chirping sounds to other crickets, ants exude chemical signals (pheromones), and bats use echolocation to “see” in dark caves. No living organism exists in total isolation from its surroundings, and no organism can afford to ignore external stimuli likely either to enhance or jeopardize its existence. This is what all organisms do as long as they live: they interact with other organisms and with inanimate elements of the environment, absorbing the needed resources and useful information while avoiding potentially harmful situations, thus optimizing their existence, which in biological, Darwinian terms means increasing their chances of surviving and reproducing.

A special case can be made for the human species, by arguing that it is unique in the animal kingdom by having its sensory and nervous systems tuned to other kinds of information than that directly contributing to survival and reproduction. It is not immediately obvious, for example, how religious devotion, passion for art, music, fictional narratives or sport, scientific curiosity, philosophic speculation, personal introspection, a sense of humour, celebrity cult, interest in family history, gossip and so on should serve the same “primitive” biological functions as fighting over food, territory or mating partners, or running away from predators. Even if many things that humans do or think about can be, on closer inspection, directly or indirectly related to the basic biological needs of survival and reproduction, it

can be argued that unlike all other animals humans are also *aware* that they do and think these things; that they possess a unique mental capacity called consciousness; that they are not totally subordinated to automatic, instinctive responses, but can voluntarily choose whether to act upon instincts or not; and that in addition to reacting to the physical, external environment humans have created, uniquely in the animal world, an alternative, seemingly non-biological, language-mediated virtual reality subsumed under the term symbolic or spiritual culture.

The present book is basically about human interactions with the natural and social environments, seen in a broader context of animal communication from which human sensory perception and the brain have evolved. My interests in communication theory go back to a paper I gave at the *Third Symposium on Iconicity in Language and Literature*, held at the University of Jena in Germany in 2001, called “From signal to symbol: towards a systems typology of linguistic signs” (Sadowski 2003: 411–424). The object of my paper was to offer an exhaustive classification of linguistic signs within the framework of systems theory of information, supported by certain claims concerning the origin and evolution of human language. Starting with the general premises of systems theory (see Chapter 1) I generated, by way of logical deduction, what looked like a complete set of basic types of linguistic signs, including signal, emotive sign, iconic sign, and arbitrary, or symbolic sign, which turned out to be related in some respects to Charles Sanders Peirce’s celebrated semiotic triad of icon-index-symbol. The rather broad scope of my paper was, unfortunately, out of sync with the modest twenty-minute format of my presentation, leaving my audience, as well as myself, quite dissatisfied as to the closer characteristics of the distinguished signs, to say nothing of their exemplifications. In the following years, between one research project and another I continued my work on systems theory of signs, which I eventually extended beyond language to other forms of communication, from animal communication in defined biological contexts to iconic and symbolic communication, mainly auditory and visual, underlying human behaviour. In the process I have both expanded and modified the basic set of signs distinguished in my initial paper, and accumulated more actual instances of animal and human communication as an empirical validation and support of the deductive theory of signs, now presented in book form.

As I explain in more detail in Chapters 1 and 2, systems theory presents itself as an attractive alternative to mainstream theoretical formulations within contemporary humanistic disciplines, including semiotics as a study of signs and communication. Modern semiotics derives originally from Peirce’s philosophic pragmatism on the one hand, and from structuralist linguistics of Ferdinand de Saussure on the other hand. These early formulations (especially Saussure’s) were merged in the course of the twentieth century with other intellectual trends and schools, including Marxism, psychoanalysis, deconstruction *etc.*, to produce what is now known

as postmodern theory—an eclectic, confused, anti-scientific and pseudo-philosophic (in my view) way of thinking, talking, and writing about the human mind, language, and culture, which by now has more or less monopolized intellectual life in the arts departments of Western universities. In Chapters 1 and 11 I give some reasons why I think postmodern theory is inadequate to explain reliably the working of the mind, language, and culture, and why we need to look for alternative, more science-based theories to address these crucial human phenomena.

The deductive method of systems approach involves moving from general premises to specific theoretical formulations, and then to actual examples, in our case of communication, as found in the empirical world. Basically, I begin with two definitions: one in which system is understood as a set of interrelated elements, and the other in which interactions between systems are defined in terms of exchanges of information and energy. This is the starting point of the systems model of communication, which subsequently leads us to two main kinds of communication: (1) direct, or contiguous communication, which accounts for most instances of interactions between living systems; and (2) indirect communication, including the following types: indexical, iconic, and symbolic. The distinguished types of communication thus determine the structure of the present book, in that the successive chapters proceed from most simple (contiguous) to most complex (symbolic) forms of communication, corresponding roughly with the progressive evolution of animal and human cognitive mechanisms.

Thus in contiguous communication empirical systems interact by receiving and responding to physical stimuli occurring there and then, directly affecting the systems' existential situation and physical condition, and requiring immediate adaptive response, as in fleeing from a predator or approaching a mate. Most animal interactions with the environment, as in exchanging warning signals with conspecifics or reacting to danger signals produced by enemies, rely on contiguous, or simultaneous communication, which largely depends on inborn, automatic reactions to certain typical, adaptively significant situations, mainly concerned with survival and reproduction. Much of human behaviour also consists of contiguous interactions with the social and natural environments, facilitated by innate psychological mechanisms (cognitive modules) prompting spontaneous, emotive and physiological reactions especially in situations of emergency. The nature of these reactions is in turn determined by needs, here understood as temporary disturbances in the system's functional equilibrium in relations with the environment. The exhaustive set of needs as motivators of behaviour is accordingly discussed in Chapter 3. They include, on the scale from most energetic (or physiological) to most cognitive (or "spiritual"), the following types of needs: procreative, nutritional, protective, social, exploratory, aesthetic, and teleological. Of all seven types of needs only the last one, teleological, is found exclusively among humans. It is the

“highest,” most sophisticated of the cognitive needs, concerned with an often compulsive search for the purpose and meaning in one’s own life, in the life of one’s community, of humanity in general, and in the existence of the universe. I relate the origin of the teleological need to the specifically human extended perception of the passage of time, or working memory, which is also a psychological prerequisite for consciousness and the ability to communicate by means of signs referring to temporally displaced objects and events. Religion, philosophy, and art are the most obvious historical examples of symbolic systems invented in response to the specifically human need to find purpose and meaning in life.

As I argue in Chapters 4–6, in indexical communication systems do not interact directly with one another but by means of an intermediary system (index), created as a physical change in the environment by the reacting system. For example, a fingerprint is an index left behind on objects upon touch by a person as a reacting system. Other typical examples of indexes include a shadow, a voice, a smell, a written signature, or a photograph. Indexes are either fully contiguous with the systems that produced them, as in the case of a shadow, a mirror reflection, and voice, or they are spatio-temporally displaced from their creators, as in the case of a footprint remaining in the soft ground after it was impressed by a passing person or animal, or in the case of a photograph or a film showing a person now much older or dead. Due to its indirect nature indexical communication marks the beginning of reference and spatio-temporal separation between sender and receiver. To be able to register and interpret indexical signals usually requires higher cognitive faculties than those involved in simple contiguous communication, in that a receiver has to infer the past presence of an invisible sender on the basis of a trace, or subtle change in the environment, left behind by the latter. For instance, it appears that only humans can read footprints as evidence of animals that made them; other primates, intelligent as they may be in many other respects, appear incapable of noticing, let alone interpreting footprints as visual cues of other animals.

An interesting case of indexical communication is photography, discussed in Chapter 5, which additionally involves a principle of resemblance between sign and its referent—a situation more typical for iconic communication. Photography is indexical in so far as the represented object is mechanically “imprinted” on the photographic image by means of a photo-chemical or electronic process operating largely outside the photographer’s control. At the same time the resulting image also bears a strong visual resemblance to the represented object, which accounts for the iconic character of photography. The degree of accuracy and truthfulness of the photographic image achieved by its indexicality is unique in the history of human iconic representations of the world, the fact that explains the compelling psychological effects of photography, unattainable by even the best executed

paintings. This is why in my discussion of photography and the social significance of the photographic media such as film and television (Chapters 5 and 6) I use psychological categories normally reserved for the emotive and irrational effects produced by magic, with its objectively wrong but psychologically compelling sense of direct, causal connection between objects once physically connected but later separated (as in sympathetic magic), or between objects that appear similar to one another (as in homeopathic magic). The unique psychological power of the photographic media is thus due to their iconic indexicality, which combines and intensifies the psychological effects produced in traditional societies by sympathetic and homeopathic magic.

Perceived similarity or analogy between otherwise different and physically unconnected objects is the basis of iconic communication, discussed in Chapters 7 and 8. Iconicity is by no means limited to interactions between humans, but can be found among other animals which likewise interpret received stimuli following the principle of structural resemblance between the perceived object and a generalized concept of that object which the animal holds in its brain. For instance, the innate concept of a snake enables an ape to react in its adaptive interest (by running away for instance) to any elongated object on the ground moving in a wavy, snake-like manner. Associating objects through perceived similarity is also the basis of mimicry, a widespread form of deception practised by many species of insects for example, which have developed often uncanny resemblance to other objects found in their environment, such as twigs or leaves, to avoid being eaten by predators.

Among humans the tendency to notice similarities between different objects and to interpret the world in terms of analogies and correspondences between often unrelated domains are among the most pervasive and persistent cognitive habits, as evidenced by the perennial and universal tendency to personify elements of non-human environment, that is, to attribute human traits to animals or even plants and inanimate objects. The analogizing tendency underlies much of human culture, as evidenced by the visual representations of art, including more or less realistic depictions of animals found in the Upper Palaeolithic cave paintings, the naturalistic renditions of the human body found in European art in the Greco-Roman period and later from the Renaissance onwards, and the quasi-realistic representations of non-existent objects such as religious deities and fantastic creatures found in visual art around the globe. The actual or residual homeopathic magic, that is, a tendency to identify an artistic representation of an object with the object itself, explains human fascination and in some cases religious awe at the act of creation and contemplation of works of art, which are subconsciously perceived as possessing an invisible but “real” connection with the represented object, thereby permitting an illusory but psychologically compelling sense of communication

with and control over that object, be it a fierce animal, a deity, or a person from a painted portrait.

Because of its roots in structural linguistics mainstream semiotics is primarily concerned with symbolic signs, that is, with signs whose outward form is related to their referents in an arbitrary, conventional way. Symbolic signs are best exemplified by syntactic language, a system of communication and representation of the world found uniquely among humans and accordingly regarded as the prime marker of humanity. Indeed, while communicating by means of contiguous interactions, indexes, and icons is found both among humans and other animal species, nothing remotely resembling the combinatorial nature of syntactic speech and the widespread use of arbitrary linguistic signs can be attested in the natural world outside the human domain. Having said that, I must stress that the transition from indexical, or symptomatic, and iconic, or mimetic communication to a fully developed symbolic system of human language appears to have occurred gradually in the course of human evolution, initially through a hypothetical proto-language with rudimentary combinatorial syntax, which also retained a range of iconic features, as evidenced today by emotive sounds and intonation, by onomatopoeia, synaesthesia, as well as by morphological and syntactic iconicity. As I argue in Chapters 9 and 10, the celebrated arbitrariness of the linguistic sign appears in fact to form only a part of language's communicative function, which also includes the more archaic, symptomatic, emotive, and iconic features, still performing their communicative role at a largely unconscious level and outside the system of language as studied by structural linguistics. The holistic character of systems theory thus allows for a fuller and therefore probably truer view of language, just as the evolutionary perspective provides persuasive explanations of the benefits that symbolic communication conferred on early humans. Both the arbitrary linguistic signs and the combinatorial syntax appear to have emerged gradually in the course of human evolution as more effective communicative solutions to the ever-growing complexity and demands of social life, coupled with the ever-increasing sophistication of human brain circuitry and behaviour.

I end my book (Chapter 11) with a hypothesis concerning the origin and persistence of a universal human phenomenon of faith, that is, unquestioning and strong conviction about the existence of empirically unverifiable entities, such as those described by religions, myths, superstitions, philosophic systems, pseudo-scientific theories, political ideologies, or private delusions and fantasies. The source of what is both most noble and most pernicious in humans, the susceptibility to form strong beliefs in objectively non-existent entities appears to be rooted on the one hand in the human need to find purpose and meaning in life, and as such it forms a part of human nature, together with consciousness and the ability to acquire language. On the other hand I am inclined to seek reasons for the

specifically human propensity to form uncritical beliefs in certain by-products of the combinatorial nature of language, and in related cognitive modules responsible for combinatorial thinking. By combining and re-combining words and mental concepts it is possible to generate whole systems of virtual, symbolic reality, often (as in the case of religion) unconnected with the empirical world in any visible or rationally acceptable way. For reasons that still await further psychological explanation, the virtual realities produced by the combinatorial mind exert a powerful, almost enslaving influence on human thinking and understanding of the world, often by completely blocking out scepticism, common sense, rational judgment, and simple acceptance of the evidence of the senses. The fact that combinatorial language for the most part uses arbitrary signs, with no physical or perceptual connection with their referents, also contributes to the process of distancing the concepts and images produced by the mind from the physical, empirical reality. Uniquely in the animal kingdom therefore humans live partly in an alternative, virtual reality, under the pressure of what I call symbolic compulsion, which creates empirically distorted, false, but psychologically often irresistible models of the world. Of all kinds of symbolic systems produced by human combinatorial mind, only scientific theories appear to maintain a programmatic connection with the empirical reality, by having their claims and propositions tested and verified through observation and experimentation as a matter of principle. Because of the greater reliability of science-based approaches over more speculative, philosophic theories, I close my book promoting closer links between the humanities and the sciences, by adopting the evolutionary paradigm of biology to the study of the human mind and its products such as art and literature.

Systems theory

Between philosophy and science,
but more science than philosophy

The words “symbol,” “signs,” and “communication” used in the title of the present book immediately call to mind the discipline known as semiotics, that is, a study of signs and symbols, whose modern origin is associated on the one hand with the American philosopher Charles Sanders Peirce (1839–1914) and on the other hand, quite independently from Peirce, with the father of structural linguistics, the Swiss Ferdinand de Saussure (1857–1913). While it is not my primary intention to recapitulate the original formulations of these pioneering scholars (their contributions are routinely discussed in readily available textbooks, anthologies, and introductions to semiotics), the understanding of what signs are and how they convey meaning lies at the heart of my present, of necessity “semiotic” undertaking (Sebeok 1976, 1994; Silverman 1983; Blonsky 1985; Sless 1986; Nöth 1995; Chandler 2002). The problem of the definition of sign will be addressed in the next chapter, which will also explain why I think it is methodologically unsound to introduce definitions of crucial terms at the beginning of inquiry, before the theoretical foundations on which these definitions are based are first laid down.

The theoretical framework within which I intend to discuss the nature of signs and communication is denoted in the title of my book by the word “systems.” Historically, systems approach relates to an integrative scientific methodology initiated by the pioneering studies of the Vienna biologist Ludwig von Bertalanffy (1901–1972), who in the 1930s formulated a theory of self-organizational dynamics in biological organisms, also referred to as organismic system theory. Originally developed as a methodological framework within natural sciences, the theory was later transformed by Bertalanffy into the General System Theory, a study of self-regulation in open systems (that is, systems interacting with their environment), for which Bertalanffy encompassed the classical concept of the system and the modern cybernetic theory of feedback (Bertalanffy 1973, 1981; Capra 1996: 46–50). For Bertalanffy the General System Theory was a sort of meta-theory, a new, overarching paradigm to be used in the construction of theoretical models in all sciences, and designed primarily to investigate so-called isomorphisms,

that is, functional analogies across different empirical domains, including living organisms, social systems, and cybernetic machines.

After Bertalanffy's original formulations, the movement towards a more integrative methodology in sciences acquired momentum in the post-war period, as a multidisciplinary effort of scholars adopting the systems methods from their respective, often disparate disciplines, such as cybernetics, mathematics, philosophy, psychology, biology, computer science, anthropology, and literary studies (Ackoff and Emery 1972; Laszlo 1969, 1972a, 1972b, 1983, 1993; Mazur 1966, 1970, 1976; Sadowski 1992, 1999a; Schmidt 1982; Rapaport 1986; Weinberg 1975; Wiener 1948; Wilden 1980; Wilson 1990). The integrative methods of systems approach were initially seen as a possible remedy against the increasing fragmentation of science into narrow, specialized fields with their separate objects of investigation and different methodologies. Despite the general tendency towards multiplication of academic disciplines, it was becoming increasingly obvious to many scholars that empirical reality did not present itself as fragmented and compartmentalized, and that natural, social, and psychological phenomena were not to be explained in terms of exclusive dichotomies of natural versus cultural, physical versus biological, psychological versus somatic and so on.

The basic change in approach to empirical reality involved viewing it as an integrated whole, in contrast to the properties of its parts studied analytically in isolation according to the mechanistic paradigm of classical science (Capra 1983: 93–117). According to the integrative systems view, as espoused by the physicist Fritjof Capra for example, the essential properties of an organism are properties of the whole, which none of the parts possess in themselves. The holistic properties arise from the interactions and relationships between the parts, while the properties of the parts can be understood only from the organization of the whole (Capra 1996: 29–30). A classic example of an integrated whole is the organic cell, in which none of the organelles, that is, specialized subunits within a cell, works alone but all interact and co-operate to form a larger unified entity of the cell (Campbell 1996: 136). Biologists routinely recognize that plants and animals are co-ordinated wholes rather than colonies of tissues and organs. As Richard Dawkins explains, this is because natural selection has favoured genes that co-operate with others, so that in the struggle for survival nature must have put a premium on central co-ordination rather than anarchy within the living organism (Dawkins 2006a: 46–47). Systems scholars also perceive that not only individual organisms but also entire domains of the empirical world: physical, biological, social, and psychological reveal structural and functional parallelisms, which can be usefully integrated and illuminated within the same methodological framework (Laszlo 1983: 4–5). As argued by Bertalanffy and the philosopher Ervin Laszlo, the general character of systems theory can help integrate both the physical and

non-physical disciplines into a unified scientific vision, to bring about a much-needed integration of scientific and humanistic methodologies and education.

Why we need a theory

The assumption that reality consists of integrated and interconnected wholes is thus the main tenet of the systems understanding of the world. In that the systems approach follows other explanatory models devised by philosophy and science, which are all based on certain initial assumptions as well as logical, observational, and experimental procedures that differ from non-scientific, metaphysical, or commonsensical thinking about the world. At the same time it should be added that creating models of reality is not confined to philosophers and scientists, or even to humans. As the evolutionary linguist Derek Bickerton reminds us, all living creatures have internal representations, or models, of the external world, not so much that they should contemplate the structure of the world, but so that they should be able to survive and function effectively in their environment (Bickerton 1990: 250). Humans too negotiate their living space by developing internal models of the outside world, modified and adjusted by sense data, models so constructed as to be useful in dealing with problems typically arising in our interactions with our natural and social environments. However, of all animals only humans possess brains that appear to be able to probe the world at a depth greater than is needed to survive, and it is the task of scientists to diagnose and correct this uniquely human cognitive misalignment (Wilson 1998: 65).

Philosophic and scientific theories usually assume the form of explicit conceptual models of a fragment of reality under investigation, expressed typically through verbal language (as in philosophy), in sciences aided also by mathematical symbols, diagrams, graphs and so on. These models are not substitutes of real, physical situations, but merely their descriptive analogues—what the philosopher of science Karl Popper calls the “verisimilitude” of a theory; that is, a theory’s approximation to what it is devised to explain, or its correspondence to the empirical facts (Popper 1979: 59, 318). For instance, Einstein’s theory of relativity is a better approximation to the facts of physics than is Newton’s gravitation theory, just as the latter is a better approximation to the facts than was Kepler’s theory of planetary motion. The systems scholar Brian Wilson sums up what creating interpretive models of reality is about:

A model is the explicit interpretation of one’s understanding of a situation, or merely of one’s ideas about that situation. It can be expressed in mathematics, symbols or words, but it is essentially a description of entities and the relationships

between them. It may be prescriptive or illustrative, but above all, it must be useful (Wilson 1990: 8).

The external, phenomenal world may appear to the observer as almost unbelievably complicated and ultimately beyond comprehension. On the other hand the explanatory models, whether philosophic, religious, scientific, or commonsensical are by comparison simplified and therefore more comprehensible than the world they are devised to explain: they serve as intellectually accessible, man-made abstract analogues of the empirical world which on its own presents itself as too baffling, elusive, complex, mysterious, and ultimately probably beyond comprehension (Hawking 1996: 10–11).

But the explanatory models, such as those used in science for instance, are not just any descriptions or mental representations of the external world. A haphazard accumulation and description of empirical data does not in itself constitute a model of the world, because no data make any sense without a theoretical paradigm explaining what the data mean. In the words of the philosopher of science Thomas S. Kuhn: “there is no such thing as research in the absence of any paradigm” (Kuhn 1970: 79), an observation echoed by Ervin Laszlo: “there is no theory without an underlying world view which directs the attention of the scientist. There is no experiment without a hypothesis and no science without some expectation as to the nature of its subject matter” (Laszlo 1972a: vi). Karl Popper even argued that there is no such thing as impartial and unbiased observation, because all perception is predicated on expectations based on innate dispositions or propensities to react. In this Popper was refuting a naïve empiricist view, espoused by such early modern philosophers as Locke, Berkeley, or Hume, according to which all knowledge comes to us through experience and observation, and any attempt on our part to interfere with the process of receiving this information can only lead to distortion and arbitrary imagining. Rather, argues Popper, observation is always preceded by expectations, which give rise to hypotheses and theories about what it is we observe, although an observation can in its turn refute a particular hypothesis and stimulate a new one (Popper 1979: 344, 346).

In science the merits of a theory as an explanatory paradigm are judged by a number of formal criteria, including the range of phenomena the theory embraces, the internal consistency of its structure, the precision of the predictions it can make, and the practicability of testing them. More specifically, it is possible to distinguish the following characteristics of a scientific theory:

- *parsimony*, or economy, following the law of Ockham’s razor (after the philosopher William Ockham, 1285–1347). The law states that in explaining something assumptions must not be needlessly multiplied, because “what can be done with fewer assumptions is done in vain with more” (Wilson 1998: 56).

The object of science is therefore to explain more and more with less and less; in other words, the ever-greater numbers of phenomena in the world should be understood by the smallest possible number of scientific laws or principles—what the biologist Edward O. Wilson calls “the completest presentation of facts with the least possible expenditure of thought” (Wilson 1978: 10; Plotkin 1994: 78–79);

- *consistency*, that is, stipulating the logical rules to transform the assumptions into valid conclusions, and to ensure the internal coherence of propositions and absence of contradictions within the theory;
- *repeatability*, stating that the same phenomenon must be analysed separately by independent investigators;
- *testability*, that is, checking the model against relevant empirical evidence, but – interestingly – not so much to validate a theory as ultimately to falsify it. This is because, according to Karl Popper, “the method of science is the method of bold conjectures and ingenious and severe attempts to refute them,” as only through the falsification of theories progress in science can be accomplished (Popper 1979: 81, 361). A theory that cannot be falsified does not belong to science but to the realm of dogma, as exemplified by religious myth, theology, much of philosophy, pseudo-scientific systems such as Marxism or Freudism, and political ideology – systems of thought containing claims that can be neither proved nor disproved, but are instead put forward to be accepted on faith;
- *predictive power*, relating to the ability of a scientific theory to transform a small number of axiomatic ideas into detailed predictions that can hypothetically account for phenomena not yet discovered. For example, even before Galileo discovered the phases of Venus using a telescope, his former disciple Benedetto Castelli had predicted theoretically that if the Copernican model of the solar system was correct, then Venus must show phases, like the Moon (Gribbin 2003: 89);
- *validation*, which states that the strength of a theory is measured by the extent to which its predictions successfully compete with other theories in accounting for the same phenomena, as when the Copernican heliocentric cosmology provided a scientifically more valid description of the solar system than the earlier Ptolemaic geocentric theory.

As Karl Popper repeatedly emphasizes, the principle of testability, despite its seeming purpose to verify a theory by demonstrating its correspondence with the empirical facts, leads in fact ultimately to the falsification of the theory, since only by rejecting current theories can science make progress (Popper 1979: 81, 361). This means that scientific laws, although never fully verifiable, must ultimately be

falsifiable, and that means that they can be tested. For the philosopher Bryan Magee this is a crucial point, because if a theory (such as the religious doctrine of Divine Providence) can explain anything that happens, no matter what, this must mean that all possible observations are inevitably consistent with the theory. But in that case no actual observations can ever be cited as evidence in the theory's favour, which means that not only can the theory not be falsified, but that it consequently cannot be corroborated either. No such theory can count as scientific. To be scientific, a theory must be justified by evidence, that is, it must be empirically testable, and since the only form of testing that is logically possible is falsification, this means that only statements that are empirically falsifiable can have scientific status (Magee 1998: 62–63). Despite science's professed theoretical and procedural rigour therefore, its description of the world always remains partial, provisional, and incomplete. Scientific knowledge is thus not a revelation of something objectively and timelessly true, an assured grasp of something existing "out there" independently of ourselves. Knowledge is, in Popper's phrase, "justified belief;" it is what we have the best grounds at any given time for accepting as true (Popper 1979: 76). For all its tentativeness, however, a scientific description of the world still remains, generally speaking, more reliable than philosophic or religious one for example, in presenting us with a truer, because falsifiable, picture of the world.

Problems with philosophy

Philosophy too is concerned with an understanding of the world gained through thought and language, expressed in (usually) coherent logical argument and lack of contradiction (except perhaps in postmodern philosophy which, in Noam Chomsky's assessment, seems to thrive on fallacies, ambiguities and self-contradictions [Chomsky 1992; Nagel 1998]). Unlike science, however, what philosophy does not normally require is empirical validation of its findings, as philosophers do not conduct experiments and need no observational proofs to support their claims (Plotkin 1994: 230; Tooby and Cosmides 1992a: 22). Philosophic arguments can be intellectually stimulating, but at the same time they cannot be accepted as valid and reliable tools in explaining and controlling the physical world, which are the main intellectual and practical goals of science. According to *The Oxford Companion to Philosophy*, for instance, philosophy is not even about our understanding of the world, but is defined as "thinking about thinking"—a second-order cognitive activity about formation of beliefs and about logic underlying our claims to knowledge (Honderich 1995: 666). Philosophy thus understood is not limited in its propositions, as is science, by the physical parameters of the empirical world, but can develop by its own internal logic, independently of factual

reality. In this sense philosophy can be described as a form of mental gymnastics, an abstract intellectual activity conducted for its own sake, which keeps the mind busy but does not necessarily contribute to the understanding of things or the expansion of knowledge. Philosophy's frequent disregard for facts and empirical verification also means that its propositions, even those about the nature of the world, can often be simply wrong, or at best probable but unverifiable and therefore unreliable. While science provides a description of the laws of the world and how they can be applied, philosophy, according to the neuroscientist Gerald M. Edelman, has in fact no proper subject matter of its own, because it usually describes entities that simply do not exist outside the philosopher's mind. Each philosophic system is complete with a particular philosopher, who does not just describe an environment but constructs a whole conceptual world. Every time a philosophical construct is attempted, there is a world view behind it, and a personal one at that, labelled with various "isms," each of which is likely to spell the rejection of the last, as each philosopher constructs his own unique point of view (Edelman 1992: 158).

In this light it is difficult, for example, to make sense or assess the real importance of a philosophic text such as Ludwig Wittgenstein's celebrated *Tractatus Logico-Philosophicus* (1921), one of the most influential texts in twentieth-century philosophy, regarded as a masterpiece which revolutionized contemporary philosophical thought. The eighty-nine-page long *Tractatus* consists entirely of cryptic, sibylline, epigrammatic and elusive claims about the alleged nature of thought, language, and the world, expressed in boldly assertive and authoritative tone, but without a shred of proof or evidence that what the philosopher is saying is actually true. The text starts off by introducing certain key but vague and undefined terms such as "facts," "things," "logical space," "the world," "status of affairs," "state of things," "objects" and so on, and proceeds by prophesying *ex cathedra* rather than by demonstrating how valid conclusions about the nature of thought and language can be derived from particular premises. It is also difficult to take seriously a philosopher, no matter how famous and influential, who introduces his work with almost unbelievable certitude and self-congratulation, saying things like "the truth of the thoughts that are here communicated seems to me unassailable and definitive. I therefore believe myself to have found, on all essential points, the final solution to the problems" (Wittgenstein 2001: 4). Equally frivolous is Wittgenstein's disclaimer towards the end of the *Tractatus*, when he states that "anyone who understands me eventually recognizes [my propositions] as nonsensical" (Wittgenstein 2001: 89), supposedly because talking about language is meaningless. The *Tractatus* established Wittgenstein's international reputation as the leading twentieth-century philosopher, despite the fact that during the years of the treatise's greatest influence he deepened his conclusion that his work was

fundamentally mistaken (not that it discouraged his ardent if uncritical followers). Wittgenstein ultimately demolished his own earlier philosophy in the posthumously published *Philosophical Investigations* (1953).

If philosophy is indeed “thinking about thinking,” then perhaps abstract speculation divorced from real life can have some accidental intellectual merit, if only to demonstrate the power of the mind and language to engage in such speculation, despite the aura of so-what-ness, or irrelevance, inevitably forming over such activity. In Chapter 11 I discuss what I call symbolic compulsion as a by-product of the combinatorial nature of thinking and language—faculties that have arisen as cognitive adaptations over the course of human evolution, and which produced, as an adaptively neutral side effect, a psychologically compelling tendency to create and believe in non-empirical symbolic systems, as exemplified by religion, art, and philosophy. Science too is a symbolic system, but it is the only one to validate its symbolic constructs with observational data; hence its success in providing a relatively accurate explanation of the world, and in translating its theories into practical applications. On the other hand, abstract philosophizing is all too often conducted for its own sake rather than as an aid in understanding the world, still less to improve the material conditions of life. Philosophic thinking about thinking is like a car in idle gear: the engine is running but the car is not moving, that is, it is not performing any useful work.

Even philosophy of science seems to have limited impact, to say the least, on scientific theory and practice, despite the fact that some of the greatest modern philosophers, such as Descartes, Leibniz, Pascal, Russell, and Popper were also mathematicians, and that some of the greatest modern scientists: Einstein, Max Born, Niels Bohr, Heisenberg, and Schrödinger also wrote books of philosophical reflection. Philosophy of science can be every bit as technical and esoteric as mathematics, physics, and formal logic, and its main concern is, as in science, the nature of truth and of the scientific method (Lange 2007). But as the philosopher Hilary Putnam admits, philosophers of science are conducting their abstract speculations largely for other philosophers rather than for scientists, the bulk of whom are simply not interested in philosophic matters and do not consider them relevant to their work (Magee 1978: 203–204).

If philosophy is of limited use to contemporary science, an even stronger case of irrelevance can be made in relation to religion, which is quintessentially an irrational, unempirical mode of thinking, in that its dogmas are by definition unsupported by any evidence other than the faith and conviction of the religion’s founders and followers. Paradoxically, however, it is philosophy and religion, with their disregard for empirical proofs and, in the case of religion, for logic, that generate all the dogmatic certainties and absolute “truths” about the world, while science, for all its insistence on both logic and evidence, remains cautious and

provisional in its claims. Scientific theories are, in the words of the psychologist Robin Dunbar, merely our current best guesses: “they act like a crutch to help us struggle a little further down the road of exploration in the hope that a more precise theory will be encountered along the way” (Dunbar 1995: 97). But it is precisely this tentativeness of scientific theories that makes them relatively truer, nearer the facts, and therefore more reliable in explaining the world than the non-scientific theories. As Bertrand Russell conceded sceptically but encouragingly: “Science is at no moment quite right, but it is seldom quite wrong, and has, as a rule, a better chance of being right than the theories of the unscientific. It is, therefore, rational to accept it hypothetically” (Russell 1975: 13).

Indeed, the scientific form of inquiry would not have been born if scepticism, doubt, and the critical attitude – these philosophic but very unreligious dispositions – had not been accepted as a legitimate part of intellectual life for the first time in ancient Greece. The great historical significance of Greek philosophy from the sixth to fourth century BCE (Before Common Era) lay in this new attitude towards religious myths—the attitude of critical debate introduced in the place of a dogmatic handing on of a doctrine in which the whole interest lies in the preservation of unchanging tradition. For the first time in history doubt and criticism became an integral part of intellectual, educational, and public life, when in the place of myth and dogma we find the tradition of institutionalized criticism, open analysis and debate. Such were the historical beginnings of rational thought and scientific method. In this way the ancient philosophers and their post-Renaissance successors were directly responsible for the growth of knowledge and scientific progress in the whole of Western culture.

On the other hand religion as a traditional repository of unchanging dogmatic certainties and divine truths does not encourage (in fact, it strongly discourages: by intimidation, imprisonment, and death) creative and independent thinking, because any original thought must necessarily be different from, and therefore unacceptable to religious doctrine. In this context philosophic scepticism and the critical attitude it fostered can be viewed as a transitional mode of thinking on the way from religious dogmatism to scientific empiricism: once thought was released from the constraints of dogma in ancient Greece and later again in post-Reformation Europe, free philosophic speculation became possible, eventually to be channelled into a more rigorous and empirically valid scientific inquiry. And just as modern philosophy rendered medieval theology and scholasticism redundant as forms of intellectual inquiry, so the advances in physics and biology, made especially in the second half of the twentieth century, have in turn invalidated most of traditional philosophy as a tool to understand the world. This means that it perhaps matters less what today’s philosophers actually say than that they are allowed to say it, that they can speculate freely, even if their speculations are, often on their own

admission, wrong and nonsensical. Like their ancient Greek predecessors contemporary philosophers can still openly debate, criticize and contest official ideologies, for which they are not only left unharassed by those in power but they actually enjoy a great deal of social respect and prestige—a sign that Western liberal and open societies welcome and support institutionalized critical debate.

Scientific claims have as a rule greater empirical validity than theological or philosophic propositions, but they are also limited when compared with the latter, precisely due to science's insistence on empirical evidence and practical applicability. The scientific description of the world is at any stage confined to what can be physically demonstrated through observation or experimentation, whereas philosophic propositions can be broader and more far-reaching, precisely because they are not limited to what can be empirically shown to be true. Philosophers can therefore speculate more freely than scientists, and while many philosophic claims ultimately turn out to be false, some can imaginatively reach further than the current state of empirical research, eventually paving the way for new developments in science. Philosophic speculation and a more down-to-earth scientific research are therefore not mutually opposing forms of knowledge, but they complement one another. After all, the philosophic inquiry into the nature of the world historically preceded science, and the latter would not have been born if certain philosophic schools, such as rationalism, empiricism, and pragmatism had not risen in prominence and influence in the last few hundred years.

Indeed, the traditional division of intellectual inquiry into philosophy and science, of the investigations into the mental and spiritual dimension of human life on the one hand, and into the physical and biological phenomena on the one hand, may well soon become obsolete, as new developments in science appear to be bringing the two cultures closer together. For the astrophysicist John D. Barrow, for instance, the sciences and the humanities are not alternative responses to the complexity of the world, but two views that are intimately entwined. From a physical and biological perspective it becomes clear that humans have evolved in a particular type of universe which constrains what and how they think, why they like certain types of narratives, visual arts, music and so on (Barrow 1995: 2–4). In the late 1970s Edward O. Wilson, the founder of sociobiology, also advocated that human culture should be studied as part of the natural sciences, which should be integrated with the social sciences and humanities (Wilson 1978: 6, 9). More recently, Wilson conceived of the future of human intellectual enterprise in terms of what he calls “consilience,” that is, “the ‘jumping together’ of knowledge by the linking of facts and fact-based theory across disciplines to create a common groundwork of explanation” (Wilson 1998: 6). Speaking of the rapprochement between the arts and the sciences Wilson stated that “the momentum is overwhelmingly towards conceptual unity,” in which “the humanities... will draw closer to the

sciences and partly fuse with them” (Wilson 1998: 9). In a similar spirit of multi-disciplinary integration the anthropologists Jerome H. Barkow, Leda Cosmides, and John Tooby, the editors of the seminal book *The Adapted Mind* (1992), call for a long overdue theoretical amalgamation between biology, psychology, and sociology, the merger that “would seem too obvious to discuss were it not for the bold claims of autonomy made for the social sciences, accompanied by institutionalized neglect of neighbouring disciplines.” It is one of the astonishing features of contemporary intellectual life, say the authors of this landmark publication, that cross-disciplinary consistency should be treated as a radical claim in need of defence, rather than as a routine tool of inference (Barkow, Cosmides, Tooby 1992: 13).

Among the most interesting and promising scientific developments of recent decades aimed at bringing the two cultures together is evolutionary psychology, which applies the Darwinian theory of evolution by natural selection not just to the question of the diversity of life, but to problems traditionally reserved for sociology, anthropology, psychology, linguistics, as well as art and literary criticism (Lopreato 1984; Barkow, Cosmides, Tooby 1992; Knight, Dunbar & Power 1999, Buss 2004; Cartwright 2000; Cummins 1998; Pinker 1998; Ridley 2003). The literary scholar Nancy Easterlin, for instance, sees the convergence of psychology and biological evolutionary theory, or what she calls bioepistemology, as a way to resolve the contradictions between theory and practice now besetting literary studies. In her view, “humanists and social scientists, including literary theorists, who ignore the implications of evolutionary theory and biology do so at the cost of the increasing irrelevance of their disciplines” (Easterlin 2005: 621, 625). Notwithstanding the continuing prestige of traditional, philosophy-based humanistic disciplines in academia, arts scholars will, hopefully, come to appreciate eventually that there are only two “solid” sciences able to offer reliable methodologies for all other disciplines: physics, in relation to matter and the history of the universe, and biology, in relation to the evolution and structure of living organisms, including humans with their consciousness and culture. What happens in physical and biological sciences matters if only because it translates directly into practical domains, engineering and technology on the one hand, and medicine, chemistry, pharmacology, and food industry on the other hand. Research in these areas cannot be conducted entirely according to any philosophic or ideological views arbitrarily chosen by the researcher, as often happens in the humanities or social sciences. In physics and biology no one can afford to make mistakes without ultimately endangering people’s lives, safety, health and well being. Compared with the serious practical implications of physical and natural sciences many other academic disciplines often appear as little more than intellectual self-indulgence and social work designed to allow the undergraduate students to come peacefully of age in a relatively civilized, academic environment. Nearly thirty years ago Edward O. Wilson

and Richard Dawkins independently deplored the fact that humanists still acted as if the scientific revolution had not taken place (Dawkins 2006a: 1), and even today publications in humanities and social sciences still read as if most of basic science had halted during the nineteenth century. In Wilson's words: "their content consists largely of historical anecdotes, diachronic collating of outdated, verbalized theories of human behaviour, and judgments of current events according to personal ideology – all enlivened by the pleasant but frustrating techniques of efferescence" (Wilson 1978: 194).

In this context systems theory can be viewed as one of the ways to bridge the two intellectual traditions, by borrowing what I think is best in both philosophic and scientific types of inquiry. From philosophy the systems approach borrows the deductive method of reasoning, which basically consists in formulating a set of initial assumptions, and then speculatively transforming them into propositions relevant to the problem in hand, here: communication, signs, and production of meaning. From science in turn systems theory derives its insistence on internal coherence, empirical validity and general usefulness in explaining aspects of human behaviour related to communication. In other words, my design is to present a theory of signs and communication that can be both internally coherent and useful in explaining the origin, evolution, and function of systems of communication found in the empirical world. However, my initial approach is primarily theoretical rather than empirical, hence the use of deduction in the construction of the theory.

Logical deduction

The traditional division of scientific disciplines into empirical and theoretical, and the related inductive and deductive modes of thought underlying the two types of inquiry, respectively, still underpin the division of science into empirical disciplines such as experimental physics and biology, and theoretical disciplines, or pure sciences, such as theoretical physics, mathematics, and logic. However relevant the historic division of science into empirical and theoretical, it is clear that no type of inquiry is only empirical or only theoretical, and that the two methods are in fact inextricably linked. Induction as the main method of inquiry in empirical studies cannot exist without some a priori theoretical assumptions as to what constitutes empirical evidence and what the ultimate purpose of the research is. Likewise, deduction as the main method of reasoning in philosophy, mathematics, and logic cannot proceed without assumptions about the world that are, ultimately, of empirical nature (Johnson-Laird, Byrne 1991: 2; Gregory 1981: 232–233).

To begin with, all theoretical speculation about the world must rest on the realistic premise that both the world as the object of inquiry and the person of the

inquirer exist in the physical and biological sense. For all its seemingly immaterial and ethereal nature, intellectual speculation is the product of the very material and empirically accessible human brain, itself a biological organ devised by evolution to process information coming to the brain from the environment and generated by the brain itself (Plotkin 1994, 1997). Once the existence of the world, of the human observer, and of the cognitive processes underlying the inquiry are accepted as the necessary empirical premise, speculation about the nature of the world is never a question of either solely generalizing from observation (empirical induction), or of deriving logical conclusions from premises (theoretical deduction). One can at best talk about the domination of observation, experimentation, and manipulation of empirical data in inductive sciences, and about the domination of logical procedures in transforming premises into conclusions in deductive theorizing. Both methods have, like everything, their advantages and disadvantages, but interestingly philosophers of science appear to be inclined towards the view that the more reliable knowledge, one that offers us a better sense of what the world is “really like,” is achieved not through inductive generalizations but through deductive inferences (Popper 2002: 3; Magee 1998: 429).

Notwithstanding its seeming nearness to the hard facts of life, a strictly empirical investigation is disadvantaged both by the limitations of human sensory apparatus and by the imperfections of inductive logic. In Plato’s famous allegory of the cave from *The Republic* our knowledge of the world, as it comes to us through the senses, is equivalent to the shadows of objects cast upon a cave wall, giving us an incomplete or misleading idea of the objects themselves (Plato 2003: 275). Also, as Karl Popper points out, any generalizations drawn from observational data may always turn out to be false: for example, no matter how many instances of white swans we may have observed, it does not justify the conclusion that all swans are white (Popper 2002: 3–4). (Indeed, black swans have been discovered in Australia.) The problem with induction is that one is never certain just how much evidence is necessary to justify a conclusion, and how many instances of a particular phenomenon are needed to create a reliable general model, one that would explain instances not yet discovered, or predict new ones. A good example of a relative weakness of inductive reasoning is Umberto Eco’s semiotic theory (Eco 1976), in which an elaborate speculative model is built from a single, isolated example of communication. Eco describes a floating buoy signalling to the control panel of a car the level reached by the gasoline, and uses this situation to construct a complicated and rather confused abstract model of signification and communication of allegedly general application. One wonders whether a different example (out of an extremely large number of types of situations involving communication and signification) would yield a different theoretical model, or whether a different scholar would arrive at a similar or different model starting with Eco’s example. In

other words, Eco's semiotic theory simply begs too many serious methodological questions right from the start (in addition to employing a rather alienating structuralist jargon), to be accepted as a reliable and helpful tool in explaining how signs actually function in social communication.

By comparison, the deductive method has always been the preferred one by philosophers and logicians. It basically relies on setting up a hypothesis as a working tool and then tracking it down to see whether it works in experience. In the process of "creative deduction" (Ervin Laszlo's expression) we formulate axiomatic constructions to consider the set of all conceivable possibilities in the behaviour of particular systems under investigation, and then apply this construction to an empirical situation (Laszlo 1972a: 26; 1972b: 16–18). For the philosopher of science Arturo Rosenbleuth this is how the most important theories, such as Einstein's theory of relativity, were created: "The theory of physics is neither a mere description of experimental facts nor something deducible from such a description;... the physical scientist only arrives at his theory by speculative means" (Rosenbleuth 1970: 80). Speculation refers here to the practice of imaginative, creative theorizing to formulate a hypothetical general law that will fit the specific set of observational or experimental data, and if the fit is not found, the hypothesis can always be modified (Magee 1998: 429). So while the usefulness of a theory is ultimately measured by its power to explain the empirical data, the data alone cannot dictate the shape of the theory, as often happens in inductive thinking: theories are created speculatively by their propounders rather than induced on the basis of a large number of consistent observations and experiments.

Postmodern "theory"

Incidentally, one cannot help noticing that the characteristics of scientific theory as outlined earlier, including the explicitness of initial premises, internal logical coherence and empirical verifiability, do not appear to apply to much of what has come to be called "critical theory" within the humanities and social science departments during the last thirty years or so. Critical theory spread originally from France in the 1960s, initially among the literary scholars at the Anglophone universities, where many academics hitherto engaged in the otherwise useful work of interpreting literary texts suddenly took to writing incomprehensible, pseudo-philosophic prose, henceforth referred to simply as "theory." Often used with the adjective "postmodern" or "poststructuralist," theory was at its inception inspired by an eclectic mix of Marxist sociology, Freudian psychoanalysis, Saussurean structural linguistics, political feminism, and Derridean deconstruction, to mention just the main influences, and has with time presented itself as an all-embracing

critical method to analyse the ideological underpinnings of culture and society in general. It lies beyond the scope of my book to offer a comprehensive exposition and critique of postmodern theory, except to say that the conscious rejection of logic, of clarity of argument, and of respect for evidence displayed by many postmodern theorists, make theory, despite its continuing influence within academia, less than a reliable tool to address the fundamental problems of the mind, language, and culture (Ellis 1997; Gross and Levitt 1998; Nagel 1998; Patai and Corral 2005; Sokal and Bricmont 1998; Tallis 1995b, 1999b).

In literary studies, for example, the critic Valentine Cunningham observes that “much of what comes under this title [theory] is not, of course, strictly speaking, theoretical – at least not in a scientific sense of a proposition, a model, a theorem, a description telling you in a testable, provable-disprovable fashion what literature and the literary are and how they or one or other of their branches function” (Cunningham 2005: 25). The critic John M. Ellis also notes that “what now passes for theory is a degraded and corrupt shadow of what theory should be” (Ellis 2005: 106), not least because of the befuddled and unintelligible style of writing adopted by many postmodern theorists. The American author Barbara Ehrenreich for example complains that “students taking courses in literature, film, cultural studies, and even, in some cases, anthropology and political science, are taught that the world is just a socially constructed ‘text,’ about which you can say just about anything you want, provided you say it murkily enough” (Wheen 2004: 81–82). The depressing phenomenon of pretentious nonsense that passes as scholarly writing is largely due, ironically, to some professors of English, who regularly win prizes in the Bad Writing Contest run by the journal *Philosophy and Literature* (Myers 2005: 354).

Semiotic literature too has not escaped the unfortunate linguistic habits of postmodern discourse, and indeed for many critics semiotics is practically synonymous with postmodern theory (Blonsky 1985: ix). The semiotician David Sless deplores the ironic fact that a subject so profoundly concerned with communication should have managed to produce so many incommunicative works, full of what he identifies as loose reasoning, absence of method, sweeping generalizations, tortured neologisms, and obfuscatory and esoteric jargon (Sless 1986: 2). Likewise Daniel Chandler, the author of a useful, coherent, and blessedly readable account of contemporary semiotics shares his own frustrations and disappointment with semiotic literature, which he finds for the most part almost impossible to understand, confusing, dull and deeply obscure (Chandler 2002: xv).

A classic case in point are the semiotic studies of Roland Barthes, the prime representative of the French School of Semiology. Supposedly inspired by the structural linguistics of Saussure but in fact, as Raymond Tallis demonstrates, blatantly inverting Saussure’s ideas, Barthes’ theoretical work, described by the author

himself as “scientific,” is “muddled and grotesquely overvalued” in Tallis’s judgment, devoid of any clearly defined method or substantiated arguments (Barthes 1967: 11; Tallis 1995b: 95). In another, not untypical example, the conceptual confusion of postmodernism has produced such investigations into semiotic theory as Floyd Merrell’s book *Sensing Semiosis: Toward the Possibility of Complementary Cultural “Logics”* (1998). The book sets out to integrate, in an incomprehensible mix, Peirce’s theory of signs, “the non-Euclidean geometry of Bernhard Riemann,” the Indian philosophy of Nagarjuna, the Buddhist “five skandhas” (which allegedly “substantiate Peirce’s variation of classical logic”), the philosophy of William James, the physics of John Archibald Wheeler, information theory, and the philosophy of Jean Baudrillard – all to reflect “the vast, intractable, and ever transient rush of semiosis,” in a world which “must include a sense of both-and and neither-nor, contradiction, inconsistency, and incompleteness” (Merrell 1998: ix-xiii). Nothing in Merrell’s book justifies just such an exotic combination of inspirations, and one wonders why for instance Neo-Platonism, the Cabbala, Native American mythology, Taoism, astrology, quantum mechanics, chaos theory or any other equally incompatible system of thought has not been thrown into the semiotic mix as well. In the postmodern climate in which practically anything goes as long as it makes no sense, some intellectuals seem to have abandoned the duty to try and explain to others, as clearly as the subject permits, the world in which we live, preferring instead to beguile their readers with tedious poetic prose that passes as “theory.” In Merrell’s book, for example,

the concluding sense of semiosis is that we are, ourselves, our arrogant, pompous, imperious selves, no more than signs among signs, signs incompletely knowing themselves. The implication is: our universe is many yet one; it is what it is, yet it is always already something other than what it is/was/will be (Merrell 1998: xiii).

Admittedly, early semiotic literature, as illustrated by the writings of Peirce and Saussure, appears by contrast to be much more methodologically sound and reader friendly. Still, some of its claims too remain speculative and vague, no doubt due to the indebtedness of early semiotics to philosophic inquiry rather than to science. For instance, Peirce’s well-known classification of signs into icons, indexes, and symbols remains valid, mainly because subsequent independent research has confirmed the empirical relevance of this semiotic triad. However, Peirce’s further expansion of his classification into sixty-six types of signs is simply too abstract and speculative to be of much practical use to a semiotician investigating how signs actually work in real life (Peirce 1998: 142–143). Also, notwithstanding one’s admiration for Peirce’s intellectual achievement and his historic role as the founding father of modern semiotics, his writings still await to be closely scrutinized and if necessary corrected, instead of being quoted uncritically and accepted on the sheer

strength of Peirce's historic authority as a philosopher (Sebeok 1976; 1994). Much of what Peirce and Saussure said in their original contributions is hypothetical rather than empirically proven, and continuing uncritical admiration for these thinkers has the inevitable effect of slowing down progress in semiotic studies. While in science progress is measured by the speed with which old theories are revised or discarded, in philosophy-related humanistic disciplines uncritical reiteration of the original pronouncements often takes the place of new and fresh argument.

A systems view

What I am effectively advocating is a divorce between semiotics and philosophy and pseudo-science, and a subsequent re-marriage of semiotics with real science, to ensure that the same kind of methodological rigour, logic, and verifiability normally expected in scientific inquiry can also be applied to the study of signs. I also see the systems approach as a possible methodological alternative that attractively blends deductive logic with empirical validity and general usefulness. Indeed, one of my objectives is to demonstrate how the deductive methods of systems theory of signs can produce general statements that can be corroborated with relevant instances of communication from the empirical world.

It needs to be said, however, that systems theory does not exist as a single and unified method shared by all who use it, but varies considerably from author to author. To some, it is strictly a logico-mathematical method used to solve practical problems of organizational management or control in cybernetic machines, while to others it is another tool of abstract philosophic speculation conducted for its own sake, or even an extension of postmodern theory (Rapaport 1986; Reinfandt 2001: 280). In between these extremes are systems scholars who use the deductive formulations of the theory to address problems normally dealt with by such disciplines as economics, biology, sociology, psychology, and communication or literary studies (Bateson 1979; Knapp and Womack 2003; Mazur 1966, 1970, 1976; Oyama 2000; Sadowski 1999a; Schmidt 1982). What the present application of systems theory to the study of signs shares with these formulations is the basic definition of a system, although a full set of initial premises now needs to be presented and discussed in appropriate detail. The premises as the main building blocks of the theory are presented below in descending order, from most general to more specific, followed by brief, explanatory discussions:

- the world exists in the physical sense, independently from the human observer;
- the world is intelligibly ordered, and open to rational inquiry;
- the world consists of systems, which interact with one another by exchanging information and energy. A *system* is a set of interrelated elements;

- some systems have the capacity to maintain internal equilibrium with regard to information and energy exchanged with the environment. Such systems will be referred to as self-regulating or *autonomous* (Mazur 1966).

The assumption of the existence of things independently from the mind is one of commonsense realism, a position probably shared by most people but occasionally challenged by philosophers, as for example by the subjective idealism of George Berkeley (1685–1753), for whom objects existed only when perceived, or more recently by the “linguistic turn” of postmodern philosophy, with its claim that all perceptions, concepts, and truth-claims are constructed by language rather than by empirical observation (Popper 1979: 32–33, 323). According to the latter view, what we know and what we are able to think or imagine has been generated outside the mind in the meta-sphere of culture communicated through language, here perceived as a closed semiotic system with no reference to external reality (Tallis 1995a). Things do not exist independently from the observer, we are led to believe, but are instead magically called into being by language, not even by the mind as the subjective idealists of the past maintained. However, if we accept that both the human mind and language have come into being at some point in human evolution, it is probably saner to accept that the world existed prior to the emergence of our species with its cognitive and linguistic faculties, and that most biophysical facts are essentially non-linguistic phenomena, although we need of course a language if we wish to talk about them (Popper 1979: 315).

Another premise of systems approach speaks of the world as intelligibly ordered and open to rational inquiry, which is another way of saying that the world does not present itself as a chaotic and random conglomeration of objects, forces, and processes, but reveals itself to the human observer as a partly structured system based on more or less predictable physical and biological laws. Faced with an array of heterogeneous phenomena, the normal human impulse is to look for regularity and order, not only out of a spirit of disinterested inquiry, but primarily for survival, as seeking order in the environment appears to be innate and adaptive (Bickerton 1990: 221). The realistic (as opposed to idealistic) position requires also that the world possesses properties independent from human perception and cognitive processes, although the models of the world are of course primarily mental and linguistic constructs. The world as described by physics, from electrons and atoms up to galaxies, and the world of biology, from single-celled organisms to the complexities of the human brain and body, are indeed primarily cultural constructs, but the categories of perception and thought used by science, determined as they are by the bio-physiological organization of our species, cannot be completely arbitrary and fortuitous. Rather, human perception and cognition must in some measure correspond with external reality to enable humans to react

appropriately to relevant features of environment. No animal would survive if its categories of experience, such as space, time, substance, and causality were entirely deceptive. Without the correspondence between the mental categories of experience and the bio-physical reality, adaptively appropriate reactions would be impossible, and an organism would quickly be eliminated by natural selection. So while Plato's prisoners in the cave may not be seeing the real things but only their shadows, the shadows must be (as they are in real life) in some way representative of the objects (in semiotic terms, shadows are indexes of the objects that cast them). The intelligible order of the world, as it presents itself to the senses and the brain, cannot therefore be an arbitrary imposition of the internal working of the mind, or of the structure of language, because both the brain, the sensory apparatus, and language are themselves evolutionary products of the world, which they were designed to represent in a limited but to some extent accurate measure. What we can know about reality results therefore from a transaction between the mind, language, and the universe, in which the properties of these three domains interact with one another to produce not total fictions but varying models of what might be thought to be actually there (Bickerton 1990: 233; Plotkin 1994: 11–12).

However, the question of the role of language in creating models of the world is inescapable, because any intellectual inquiry, whether theological, philosophic, or scientific, is practically always (as is obvious in the present case) conducted through the medium of language. Devising explanatory models just by silently contemplating the world but without communicating one's thoughts to other people is theoretically possible, but nearly all intellectual inquiry on historical record has been a social activity, expressed and shared mainly through verbal language, occasionally aided by visual signs such as pictures and diagrams. This means that the properties of language as a medium of communication affect what is being communicated, here the model of the world resulting from an inquiry that uses language as its tool. I address the question of the origin of language in Chapter 10, where I also discuss to what extent a linguistic description reflects the objective properties of the world, to what extent the structure of language affects the veracity of that description, and to what extent language can even generate non-existent entities. It is probably naïve to think of language as a medium that reflects the world simply as it is, but it would also be too extreme and unreasonable to deny language its communicative and mediating function altogether, and to regard it as a self-reflexive generator of meaning totally unrelated to any extra-linguistic reality. The latter is, notoriously, the position of Derridean deconstructionists, but as the novelist Walker Percy quipped, a deconstructionist is an academic who claims that the linguistic meaning is radically indeterminate and communication is therefore impossible, but who leaves a message on his wife's answering machine requesting pepperoni pizza for dinner (*The Sokal Hoax*: 91).

A holistic approach

If we accept that the world reveals partial order or non-randomness rather than chaos and total unpredictability, the premise about the existence of systems can be the first step towards describing this order. A system is accordingly defined as a set of interrelated elements, with emphasis on interrelatedness, which precludes a situation in which different elements are thrown together at random (Bertalanffy 1973: 2, 19, 63). In other words, systems are wholes with properties of their own, where a whole is an entity larger than the sum of its parts, which means that the constitutive characteristics of a system cannot be explained by the characteristics of isolated parts (Bertalanffy 1973: 54). For example, a heap of rubbish, a junk yard, a pile of bricks, a rain shower, or a casual crowd in a public place form loose sets rather than organized systems. Adding or subtracting elements from such a set does not change the characteristics of the set as a whole (Angyal 1981: 37). On the other hand, an eco-system, a living organism, the mind, a family, a business company, an ethnic group, an artistic movement, a car, a TV set and so on each form integrated systems, in which constituent elements are interrelated and interdependent, so that removing or adding one element changes the functioning of the system as a whole. Similarly, a sequence of words picked up at random from a dictionary does not constitute a system in this understanding, whereas a group of words forming a grammatical sentence does: here the syntactic and semantic rules bind all the lexical elements of a sentence into an integrated, meaningful whole. Another familiar example of a whole irreducible to its constituent elements is the phenomenon of face recognition, which is based on global impression of many physiognomic factors working together. Many of us would be unable to describe the individual features of our closest friends, the colour of their eyes, the exact shapes of their noses and so on, but this uncertainty does not impair our feeling of familiarity with their features, which we would pick out of thousands because we respond to their characteristic, holistic expression (Gombrich 1982: 108). Holistic systems thus defined can refer to any sphere of empirical reality traditionally labelled as physical, biological, social, or psychological, because in systems analysis it is not so much the physical nature of the constituent elements that is important as the nature of the relations binding the elements together, and these can be shown to be analogous in different types of systems.

In the history of science a spectacular example of the advantages of holistic thinking as a reflection of holistic reality is Dmitri Mendeleev's (1834–1907) periodic table of elements. Prior to him, the elements were only understood in piecemeal fashion, and by 1860 sixty elements were known out of the existing ninety. What Mendeleev did with the elements known in his time was to arrange them by atomic weight and by suits of properties. In other words, he looked at the elements

not as separate, isolated components of matter, but as parts of a larger whole, possibly connected by shared properties. By arranging the elements together Mendeleev eventually formulated the Periodic Law, whereby elements placed in accordance with the value of their atomic weights present a clear periodicity of properties. Following this law, Mendeleev was able to predict the existence of yet undiscovered elements and their properties, simply by examining the gaps in the periodic table. In this way a theoretician applying holistic thinking was able to be ahead of the empirical research. Mendeleev's periodic table is still accepted as the basis for the chemical classification of matter (Hudson 1992: 196).

No empirical system ever exists in total isolation, because it always interacts with its environment, which in turn consists of other systems. In this sense all natural systems, inanimate or animate, are open systems (Bertalanffy 1973: 38). Interaction basically means that systems exchange information and energy with their environment. The concept of information is crucial in semiotics and communication studies, and will be dealt with more closely in the next chapter. For the moment let it suffice to say that information has to do with the nature of relations binding the elements of a system together, that is, with the system's structure. As systems interact, their structures change as a result of redistribution of information and energy. For instance, trees draw water and nutrients from the soil, their leaves exchange carbon dioxide for oxygen in the air, while dump leaves and fallen trees litter and fertilize the soil in return. In other words, interaction between systems (here the tree and soil) is a two-way, dynamic and holistic process, which affects and changes the structure of both systems involved. When a hole is drilled in a piece of wood the two systems involved, the drill and the piece of wood, also alter their structure with regard to information and energy: the hole becomes bigger and bigger while the drill is slowly becoming blunted (structural change), and at the same time both the wood and the drill become hot during drilling (dynamic change). To use yet another example: in love and friendship the partners do not individually possess all the properties of their relationship, because it is something more than what each partner brings into it. The interactive phenomenon also lies behind Plato's dialectic method of philosophical debate: two interlocutors, by challenging and responding to each other, can come closer to solving a philosophical problem than either could by himself. The outcome of such a dialectic debate is not merely the knowledge of one added to the knowledge of the other: verbal interaction constitutes a dynamic whole which has properties irreducible to those of each individual involved in the dialogue (Laszlo 1972a: 28).

Finally, the last premise of systems approach spoke of so-called autonomous systems, that is, systems able to maintain functional equilibrium with regard to information and energy exchanged with the environment (Mazur 1966). An autonomous system is able to control the input and the output both of information

and energy to ensure the stability of its internal structure, which effectively means that it is able to counteract either excess or deficiency of information and energy inputs. As said earlier, a system interacting with the environment affects that environment, but it is also affected itself in the process. The resulting changes in the system must neither be too small nor too large, but should be of such level and intensity as to preserve the system's internal structure and its ability to continue interacting with the environment in its own interest. (Without wishing to sound tautological, by "its own interest" I mean the system's ability to maintain its internal structure regardless of the character of changes occurring in the system's environment.) A state in which the system maintains this ability will be called *functional equilibrium*. Ervin Laszlo uses an analogous term of the "steady-state" in a system—a state in which energies of the system maintain the relationship of the system's parts and keep them from collapsing in decay (Laszlo 1972a: 37). Richard Dawkins also talks about "the survival of the stable," of which Darwin's "survival of the fittest" is only a special case, as a general law of organizing matter in the universe. A stable thing can be a collection of atoms that link up together in chemical reaction to form molecules, which may be more or less stable. The earliest form of natural selection in this sense was simply a selection of stable forms and a rejection of unstable ones (Dawkins 2006a: 13). Whether we are dealing with a simple molecule or a highly complex living organism, the principle of the survival of the stable remains the same: to maintain stability, or functional equilibrium, means effectively to remove or minimize the disturbances to that equilibrium.

To be able to maintain its functional equilibrium an autonomous system is equipped with an internal homeostatic mechanism, coupled negatively with information and energy inputs. The term "homeostasis" was coined by the physiologist Walter B. Cannon in 1932, and originally it referred to the self-regulating mechanisms of warm-blooded creatures, whose body temperature is maintained constant notwithstanding the variations in the surrounding medium (Koehler 1981: 73; Fiske 2001: 21). The same homeostatic mechanism controls the levels of blood pressure, of sugar and iron concentration, and of many other essential substances and conditions in the body. A highly developed organism thus regulates its own internal environment much as a thermostat regulates the temperature of a refrigerator.

To perform its regulating function homeostasis must be based on the principle of negative feedback, which the systems biologists Peter B. and Jean S. Medawar describe as one of the fundamental stratagems in the self-regulation of living organisms (Medawar and Medawar 1977: 15). Negative feedback between system and environment means that a strong stimulus meets with a weak response from the system, while a weak stimulus is amplified by the system. For example, overheating of the body by sunlight (excess of energy) will cause a warm-blooded

organism to perspire, to look for shade, to drink more water and so on to reduce body temperature. On the other hand a starving organism (energy deficiency) is emotionally motivated to search or hunt for food to restore the necessary nutritional balance. Examples of excessive informational stimuli in humans include loud noise, intensive social contacts, dazzling light, mental stress – any stimulus considered excessive and therefore intolerable by the system. On the other hand, deficiency of information includes silence, solitude, darkness, monotony of surroundings and so on, likewise considered intolerable and prompting appropriate reactions to restore the disturbed functional equilibrium. In this way the homeostatic, self-regulating mechanism oscillates between excess and deficiency, between the desirable and the undesirable, ensuring a state of near-equilibrium and continuity of the system's internal structure and in consequence of its existence, despite the changes in the environment (Lieberman 1984: 59; Bertalanffy 1973: 42). All plants, animals, and humans live in a potentially hostile environment, and therefore they must guard themselves against inputs causing damage to their delicately balanced structures. Excessive quantities, even of needed energies and informational stimuli, can be dangerous, and in the interest of survival the organism must be able to reduce or avoid deviations from the required level of interactions with the environment. The particular level of interactions, as well as the type and quantity of required energy and information differ from species to species, depending on the generic characteristics and the environmental niche occupied by the organism. In all cases, however, the fundamental principle of deviation-reducing negative feedback of the homeostat is the way in which living organisms increase their chances of survival and maximize their existence by satisfying their manifold needs.

Homeostatic self-regulation based on negative feedback is also a short-term equivalent to what is known in natural sciences as (long-term) *adaptation*. The latter is a macro-feature of the organization of living systems, formed by a very long process of interaction between the environment and succession of organisms extending ultimately over millions of years of organic evolution. Biological adaptations come in various forms: physiological, structural, and behavioural, and they are a result of natural selection acting upon heritable variation, the most adaptive variants being those that either reduce the energy costs of the organism, or increase its energy intake, or in some other way enhance its likelihood of surviving and reproducing (Plotkin 1994: xiv, 51).

In the next chapter I will use the assumptions of systems theory introduced in this section to develop a deductive theory of signs consistent with these assumptions. In other words, after accepting the basic premises of systems theory as axiomatic, that is, not requiring separate proofs, the next step would be to deduce further, more specific propositions from these premises, applicable to the problems

under investigation: here signs, communication, and production of meaning. Once the premises are accepted the subsequent transformations of the systems model should also be accepted as logically and, hopefully, empirically valid. If for some reasons some or all of the systems premises (such as that the world exists independently from the observer, or that mental models interpret rather than construct the world) cannot be accepted by some readers, it is always possible to treat the rest of the book as a consequence of a procedure “let’s assume that...”, and see where the argument will lead us. In other words, by employing logical deduction I claim tentativeness of argument rather than certainty, in accordance with the hypothetical nature of scientific inquiry in general.

Towards a systems model of communication

What is a definition?

Investigations into semiotic theory usually begin with the fundamental question: what is a sign? Similarly, a systems theory of signs as presented in this book should start with some definition, either borrowed or newly formulated, of what a sign is. Indeed, since I undertook to write a book on signs and communication, and have used the word “sign” several times already, it should indicate that I know what a sign is. The thing is that I do not, but I intend to find out, using the systems approach as outlined in Chapter 1 as the starting point. To be more precise, I have a vague idea that signs have to do with interactions between systems and with exchange of information, but I cannot claim any certainty about the nature of signs at this early stage, because discovering what signs are and how they work should be the goal of the inquiry, not its starting point. Therefore rather than beginning with a ready-made but largely unexplained definition of a sign, it is probably more methodologically sound to begin by asking cautiously: how can we arrive at a useful understanding of signs using, as in the present case, an independent conceptual framework of systems theory as an instrument of inquiry? This means that we have to start with the general assumptions of the theory rather than with specific definitions, and also that any proposed definitions should be shown to be logically consistent with the theory by being deductively traced back to its initial premises.

Formal definitions such as those used in philosophy and science are expressions of one of the functions of language treated as a tool in describing and explaining the world: to give verbal equivalents to objects and phenomena discovered in the world. In systems terms this means that empirical systems are provided with linguistic labels to facilitate identification, description and classification of these systems. In science as in everyday life there seems to be little problem in attaching linguistic labels to systems that can be perceived, measured, and examined: the material and solid objects such as minerals, plants, man-made objects, animals, or people. Physical objects have perceivable and easily identifiable parameters and properties, which can also be given linguistic labels, making the problem of relationship between language and the empirical world relatively unproblematic.

Problems begin, however, when language is used to refer to systems of physically less tangible status, such as functional relations between empirical systems,

abstract concepts generated by the mind, or elusive mental and emotional states. For instance, most languages seem to possess in abundance words referring to concepts such as “god,” “evil,” “good,” “sin,” “love,” “soul,” “beauty,” “truth,” “fate,” “morality,” “happiness” and so on. A particularly fertile source of abstract concepts is religion, and given its universal character all known languages possess vocabulary for metaphysical concepts of one kind or another – concepts whose referents, that is, non-linguistic empirical equivalents, are either indeterminate or in many cases probably non-existent. This is not to say that abstract concepts never have any external referents, but that the indefinite nature of these referents, combined with human tendency to believe in the empirical validity of some abstract concepts may account for the persistence and strange attractiveness of metaphysical vocabulary in language.

The persistence of abstract concepts is also due to the fact that they are difficult, if not impossible, to disprove. For example, it may be argued that while it is perhaps impossible to prove the existence of god empirically, it is also impossible to provide proofs that god does not exist, which in itself may be one of the reasons for the perpetuity of the concept itself. (By the same token it is impossible to disprove the idea that our pets are listening to our daily conversations and transmitting them telepathically to their headquarters on the planet Zog.) Modern humanistic disciplines, historically the heirs of theological and philosophical debates, appear to have inherited this penchant for metaphysical vocabulary of uncertain referential validity, while contemporary postmodern discourse has even gone a step further by openly denying that language has any relevance outside the discourse itself (the idea of sense without reference [Tallis 1995b: 84]). When reading postmodern criticism (including that on semiotics) one gets the impression that rather than addressing real problems existing in the outside world the critics invent abstract vocabulary just to perpetuate the discourse itself, which makes one think that if certain words have not been invented, these critics would have nothing to write about. As I argue in Chapter 11, human language appears to be a mixed blessing, in that it can be used as a tool to negotiate and explain the world, to exchange useful ideas, but also as an instrument for generating self-reflexively words and concepts of no discernible empirical validity. In other words, the mere presence of a word in a dictionary does not mean that it necessarily has to refer to something definite in the real world.

This preoccupation with language conceived as an object of study in its own right rather than as an instrument of inquiry and communication often leads to a situation in which every time a new word is introduced, its meaning is not determined in terms of external referents but in terms of other words, which is not the same thing. For example, in some writings of Thomas A. Sebeok semiotics emerges as a self-referential discipline, whose specialized vocabulary is explained in

terms of abstract semantic analyses rather than in terms of its usefulness in studying instances of communication found in the empirical world. Sebeok's *Contributions to the Doctrine of Signs*, for instance, contains page after page of detailed discussion of the semantic differences between the term "semiotics" and its cognates found in different European languages, including *semeiotiké*, *semiosis*, *Semiotik*, *semiotic* versus *semeiotic*, *sem(e)iotic(s)*, *Semasiologie*, *sematology*, *Sematologie*, *semology*, *semiotics*, *szemiotika* (Hungarian), *sémiologie*, *semiotica*, *semiology* etc. (Sebeok 1976: 47–58). It is as if the question posed was not how semiotics explains the working of signs in different communication systems found in the empirical world, but something like: "what are the received meanings of the word 'semiotics' in different languages?" One is reminded on this occasion of Karl Popper's warning that

we should altogether avoid, like the plague, discussing the meaning of words. Discussing the meaning of words is a favourite game of philosophy, past and present: philosophers seem to be addicted to the idea that words and their meaning are important, and are the special concern of philosophy.

Instead, argues Popper, philosophy and science should be concerned with statements, propositions, and theories that are truthful, in the sense of corresponding with facts, because "what we are really interested in, our real problems, are factual... problems of theories and their truth" (Popper 1979: 309). Bryan Magee echoes Popper by stating that "the only thing that discussion of the meanings of words extends our understanding of is the meanings of words: it does nothing, or next to nothing, to extend our understanding of non-linguistic reality." The preoccupation with the meanings of words is for Magee "a disastrous error" of twentieth-century philosophy, one that was bound to lead to "interminable word-spinning, logic-chopping, and in the end scholasticism" (Magee 1998: 61).

Still, creating a theory requires using language, which includes, among other things, the need to formulate definitions as concise descriptions of the objects of inquiry and as a way of discriminating and classifying these objects. The main object of investigation in semiotics is, naturally, the sign, and understandably books on semiotics usually begin with some definition of the sign. A definition normally assumes the form of an affirmative, explanatory statement which sounds like an answer to the question "what is x?"; here: "what is a sign?" Thus, to use an early classic example, C. S. Peirce defines a sign as follows:

A sign, or *representamen*, is something which stands to somebody for something in some respect or capacity. It addresses somebody, that is, creates in the mind of that person an equivalent sign, or perhaps a more developed sign. That sign which it creates I call the *interpretant* of the first sign. The sign stands for something, its *object*. It stands for that object, not in all respects, but in reference to a sort of idea,

which I have sometimes called the *ground* of the representamen. "Idea" is here to be understood in a sort of Platonic sense, very familiar in everyday talk... *etc* (Peirce 1998: 135).

I have quoted Peirce's well-known definition not to query it or to use it as a launch pad for my own discussion of the nature of signs, but to illustrate a logical procedure which I suspect lies behind formulating such definitions. When reading semiotic literature one gets the impression that definitions of certain key concepts, such as Peirce's definition of a sign quoted above, are often spun from thin air, without any proof that what the writer says is indeed true. In other words, my question is: how does Peirce *know* that a sign is what his definition says it is? He may well be right, but he gives us no proof of that. The above quotation is taken out of context, but nothing in what precedes it in Peirce's original text justifies its affirmative and authoritative tone. A definition such as this is more of a statement of the author's intellectual opinion, conviction, or intuition put forward before the reader to be accepted on faith, rather than a logical conclusion resulting from clearly stated premises or from observation.

The same logical objection can be raised against other definitions routinely formulated within semiotics. For example, the *Dictionary of Semiotics*, edited by Bronwen Martin and Felizitas Ringham and inspired by the Paris school of semiotics as represented by A. J. Greimas, consists entirely of arbitrary, ex-cathedra definitions of equally arbitrary, abstract, "technical" semiotic terms of unclear origin. When asked in 1985 about the development of his semiotic theory, Greimas is reported to have said: "My theoretical genius, if I can so call it, was a form of 'bricolage'. I took a little Lévi-Strauss and added some Propp." He also said that he was inspired by Dumézil, Saussure, and Hjelmslev (Martin and Ringham 2000: 4). Such an eclectic, impressionistic "bricolage" of ideas picked ad hoc from different authors may have some accidental merit, but it hardly bespeaks a "theoretical genius," or makes the resulting theory "scientific," which is what Martin and Ringham call Greimas's contribution to semiotics. Greimas's eclectic method is rather like taking pieces from different jigsaw puzzles and forcing them together to create a new picture. Even if the pieces somehow "fit" into one another, the resulting picture is far from coherent: an abstract patchwork of colourful spots rather than a meaningful image. The "colourful spots" of a semiotic theory thus created are the entries in Martin and Ringham's *Dictionary of Semiotics*: we neither know how these terms and their definitions have been arrived at, nor what logic or evidence justifies their affirmative, authoritative tone. It is similar with Umberto Eco's semiotic theory, with its "technical," pseudo-scientific terminology and equally arbitrary, inexplicable definitions, obscure diagrams and schemas, designed more to beguile and mystify rather than to clarify and elucidate what signs are and how

they work in the real world (Eco 1976). By contrast, entries in dictionaries and textbooks of chemistry, biology or any other scientific discipline include technical terms and precise definitions reflecting current state of knowledge about the respective empirical domains, shared and agreed upon by all scientists working in the area. In semiotics on the other hand, despite the authors' frequent insistence on the "scientific" nature of their theories, definitions are often dictated by individual, often idiosyncratic, intellectual temperaments and opinions rather than by generally agreed, logical and verifiable assumptions and observations.

Information as difference

Let me therefore initiate a process that will hopefully lead us eventually to a useful definition of a sign in the light of systems theory. Let us start by returning to the third premise introduced in Chapter 1, that about systems interacting with one another by exchanging information and energy. In the simplest case we are dealing with two interacting systems X and Y, as shown in Figure 1.

The schema describes the reaction (output) of system X providing a stimulus (input) to system Y; this input in turn causes system Y to react, thus providing an input to system X. System X reacts to this input by producing another output to system Y, and so on. Any system's reaction is thus always a part of an interactive loop, because no empirical system exists in a vacuum, without interacting with its environment, which in practice consists of other systems. As I also said earlier, interaction is always a two-way, give-and-take, feedback process that changes the structures of both systems involved, as each system internally transforms stimuli into reactions. A change within a system can be defined in terms of a difference between physical states, as shown in Figure 2 (Mazur 1970: 12; Sadowski 1999a: 45).

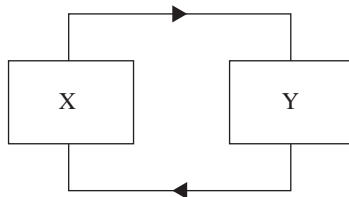


Figure 1. Interaction between two systems

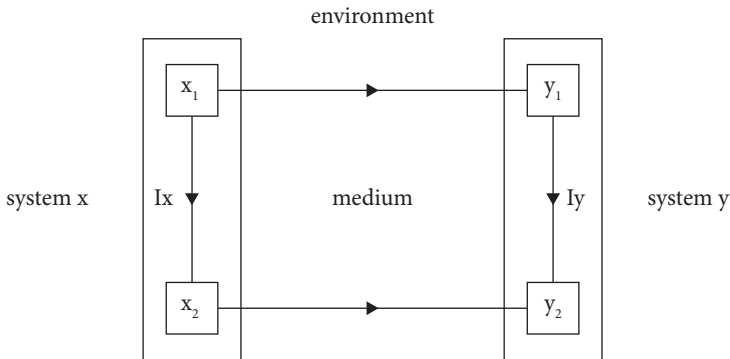


Figure 2. Information as a difference between physical states

The schema describes more closely what happens in interacting systems X and Y. (To obtain a full picture we would have to include the feedback reaction of system Y, but for the sake of clarity of presentation it is sufficient to concentrate on one reaction at a time.) The little boxes marked x_1 and x_2 in system X represent two physical states; more precisely, a transformation of state x_1 into state x_2 . Transformation also involves energy, since transforming one state into another means creating a potential difference between these states. Following the cyberneticist Marian Mazur let me introduce a definition, whereby a difference between physical states in a system will be called *information*, here marked I_x in system X (Mazur 1970: 13).

When interacting with system Y, system X causes a corresponding difference between physical states in system Y, represented by a transformation of state y_1 into state y_2 in Figure 2. This transformation is also information, here marked I_y . This is basically what is meant by interaction understood as an exchange of information. For instance, when a meteor crashes onto the earth it breaks up on impact, creating also a crater in the earth. During the interaction (crash) a change/information is caused both in the structure of the meteor (system X) and in the surface of the earth (system Y). The resulting changes/information in system X and system Y correspond to one another: from a mechanical point of view the force causing the meteor to break up is proportional with the force creating the crater in the earth. This is of course due to Newton's Third Law of Motion, whereby whenever one object exerts a force on a second object, the second exerts an equal and opposite force on the first (Giancoli 1995: 80).

As said above, interaction is a two-way process, involving systems whose behaviour alternates between receiving stimuli from other systems and producing reactions directed at other systems. It is also clear that every interaction must start with the first reaction produced by one system, followed by the first stimulus

received by another system. In a conversation, for example, there is always the first utterance produced by one of the communicators (an introduction, a question, a greeting and so on), heard and possibly responded to by the other communicator. Let me therefore introduce a definition, whereby the first reaction of system X will be called *original*, whereas the first stimulus received by system Y will be called *image*. It may also be useful to introduce related definitions, whereby system X producing the original will be called *reacting system*, or *sender*, whereas system Y producing the image will be called *receiving system*, or simply *receiver*.

Thus in addition to transformations of physical states occurring within interacting systems (original I_x and image I_y), there also occurs a transformation of states between the systems. This is indeed what happens when systems interact with one another: they exchange information. Let me therefore introduce another definition, whereby a transformation of physical states (that is, exchange of information) between interacting systems will be called *communication*. In other words, communication means transforming originals produced by sender into images produced by receiver. On the other hand the particular physical or technical channel through which originals are transformed into images will be called *medium*. The received definition of medium in communication studies is, similarly, “the technical or physical means of converting the message into a signal capable of being transmitted along the channel” (Fiske 2001: 18). The physical media may refer to the sensory channels used by living organisms in their interactions with environment: the visual, auditory, olfactory, gustatory, and tactile senses. The man-made media in turn refer to the cultural extensions of these senses, including painting, sculpture, film, photography, writing, print, architecture, theatre, voice, music, perfume and so on.

To define information in terms of a difference between physical states is another way of saying that information is anything that is different from something else. Derek Bickerton offers a similar definition of information from an adaptive, biological viewpoint, calling it “news of some change in some dimension of the environment that has a potential effect, life-threatening or life-enhancing, on some particular creature” (Bickerton 1990: 77). In this sense, for example, a difference between light and darkness is information, as is a difference between an empty page and a written page, or between one speech sound and another, or between two letters, between two gestures, two different smells, facial expressions and so on. Absence of a stimulus as compared with its presence is also information, as exemplified by an empty page as compared with a printed one, or by silence as compared with speech. For instance, the African elephant’s alarm call is silence, what Thomas Sebeok calls a “zero sign” (Sebeok 1994: 18). Similarly, any physical movement automatically creates information, since a moving object constantly changes its position in relation to its surroundings. Indeed, for evolutionary

reasons our visual perception appears to be geared towards moving objects rather than static ones, as movement is one of the main behavioural characteristics of animals, the “quick,” that is, alive creatures, which are important from the point of view of human survival and adaptation, either as sources of potential danger or of potential food. Receiving information understood as difference in the environment thus corresponds to what psychologists call “perception,” defined by the physiologist Derek Denton as “the discrimination of an object or event through one or more sensory modalities, and separating them from the background inflow” (Denton 2005: 102).

Interacting systems, information, and media are not the only elements of communication: the exchange of information can also be affected by external, environmental factors existing independently from the interacting systems and the particular medium of communication. The use of a medium (visual, auditory and so on) depends on the presence of specific environmental conditions, so that for instance a system able to react to visual stimuli will not perceive objects in the dark, just as large distance, extraneous interfering sounds, or physical obstacles will hinder or distort audition and consequently the understanding of verbal utterances between two speakers. In his model of animal communication the biologist Marc D. Hauser lists the following, more specific environmental factors likely to cause loss or distortion of information between sender and receiver: (1) general spreading effect due to lack of complete directionality; (2) attenuation due to environmental influence such as vegetation or climate; (3) reduction in strength of signal due to background noise; and (4) the initial intensity of the signal and the sensory threshold of the perceiver (Hauser 1998: 73). Background noise includes accidental physical side-effects interfering with information that are not intended by sender, such as visual or sound distortion, “grain” on a photograph, crackling in a telephone wire, static in a radio signal, or “snow” on a television screen. The manifold influences external to communication but affecting the accuracy of transmitted information are subsumed in Figure 2 under the general category of *environment*.

Contiguous communication

In various ways therefore noise and other environmental factors affect the accuracy of communicated information, not unlike in the telephone game, also known as Chinese whispers, in which a phrase or sentence is passed on from one player to another, becoming subtly altered in transit. Without the environmental interferences information is communicated accurately between interacting systems, in the sense that information in the original (sender) will correspond with information

in the image (receiver). Let us call the exchange of information between interacting systems *direct communication*. Given the possible spatio-temporal relations likely to occur between interacting systems in the empirical world, direct communication will involve the following types of situation:

- Image and original co-exist within the same spatio-temporal context, as in the earlier example of the meteor on impact with the earth. Two animals fighting or mating with one another, or two people looking at or talking to one another face to face are also cases of interaction between systems co-existing within the same time and space, and remaining within the range of each other's sensory field and attention. This type of direct interaction illustrates what can accordingly be called *contiguous communication*. It is by far the most common type of communication, found as a prerequisite for more advanced forms of communication used by organisms equipped with the nervous system and capable of using displaced reference (see sections on indexical, iconic, and symbolic communication below). Systems that do not process information internally, as is the case with inanimate objects, “communicate” only contiguously by exchanging physical states in the form of mechanical forces and chemical substances. Contiguous communication is also the foundation of animal and human communication, where it defines the very spatio-temporal co-presence of the communicators, before the exchanged information is even processed and interpreted;
- Image and original exist within the same spatial context, but not within the same temporal context, as when a piece of rock formed millions of years ago is examined by a geologist, or when an ancient vase is unearthed by an archaeologist, or when an old document is examined by a historian. A direct interaction between an image that is temporally separated from original is the basis of what can be called *spatially contiguous communication*. Academic disciplines such as geology, palaeontology, archaeology and history are accordingly institutionalized ways of engaging in spatially contiguous communication with the natural and social environments. In addition to these scientific disciplines designed to investigate the past directly by examining both natural and man-made objects produced a long time ago, human desire for spatially contiguous communication extending beyond the immediate experience has found an outlet in elements of fantasy and fiction such as time travel, in which individuals (shamans, magicians, or mad scientists) are able to transport themselves bodily to some chosen place and time either in the past or in the future. It is also interesting to note that while contiguous communication is shared by both humans and animals, spatially contiguous communication seems to remain an exclusively human domain as a function of memory (see Chapter 4): for all we know, non-human animals have no concept of the

past or the future, and henceforth they have no interest in engaging in communication with anything other than the immediate here-and-now.

Spatially contiguous connection with objects removed in time is also the basis of such widespread cultural phenomena as the cult of relics, fetishism, or sympathetic magic, in which an object is invested with special emotional significance deriving from its earlier physical contact with another object or person: a saint's bone, a lover's lock of hair, water from a holy well, a phial supposedly containing the blood of Christ, an alleged splinter from the Cross, Elvis Presley's handkerchief, Marilyn Monroe's dress, Eric Clapton's guitar and so on. Spatially contiguous communication underlies human fascination and almost "magical" obsession, found today in collectors of memorabilia for example, with material objects that have been either a part of or in physical contact with culturally significant persons or other objects;

- Image and original exist within the same temporal context, but not within the same spatial context, as when two people talk over the phone. Before the invention of the telephone the theoretical possibility of interacting directly with a spatially displaced communicator found an outlet in beliefs in telepathy or in communication with spirits. Elements of magic and fantasy, in which magicians wearing hats of invisibility change locations instantly at will, or where space crew members from futuristic science fiction films are beamed up instantly to another location and back again, also exploit a desire to communicate directly with distant, normally inaccessible locations. A direct interaction between spatially separated images and originals will be called *simultaneous communication*.

Indexical communication

As I stated earlier, by interacting with their environment systems transform that environment by causing physical changes in it. Let me introduce a definition whereby a physical change in the environment produced by reacting system X (sender) will be called an *index* of that system. For example, a crater in the ground caused by an exploded bomb is an index of that bomb, a footprint left in soft ground is an index of a person who stepped in that spot, a smell left behind by a passing animal is an index of that animal, loud music audible from an adjacent apartment is an index of a stereo system located in that apartment, a recorded voice or handwriting is an index of a person and so on. In these examples an image (perception of a smell, footprint, or noise) refers to an original, here index (smell, footprint, noise), which in turn is an image of another original that physically produced the index in the first place. Thus an animal is the original that produces

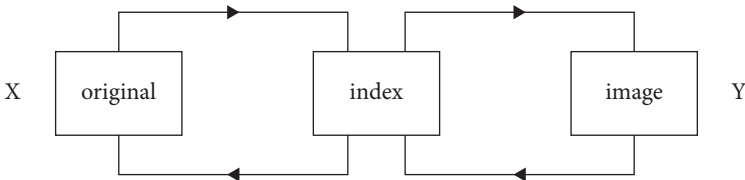


Figure 3. Indirect communication (here: indexical) between systems

a hoof print as an image (index), which in turn becomes an original for a hunter who notices (image) the hoof print. When information is exchanged between systems by means of another system (here: index), we are dealing with *indirect communication*, as represented graphically in Figure 3.

In the schema systems X and Y exchange information not by means of direct interaction, as in contiguous communication, but indirectly by means of a change, or index, produced by reacting system X in the environment. This type of exchange of information will accordingly be called *indexical communication*.

As with direct communication discussed earlier, given the possible spatio-temporal relations likely to occur between interacting systems, indexical communication can involve the following types of situation:

- Original, index, and image co-exist within the same spatio-temporal context, as always happens for instance with a shadow (index) cast by an object (original), or with the voice produced by a person one is directly talking to. Smell and body heat are also indexes that a person or an animal always carries around with them. Likewise, smoke rising above the trees is an index of the fire blazing underneath and so on. Interacting with an index that is fully contiguous with its original means in most cases interacting with the original itself, but in the dark, for instance, the proximate presence of an invisible person (original) can be inferred from the heat emanating from the body, or from the sound of breathing, that is, from an index of that person. This type of indirect interaction illustrates what can accordingly be called *contiguous indexical communication*, which in practice is very close to fully contiguous, that is, direct communication, because here the index forms an immediate physical extension of the original. However, it still makes practical sense to distinguish between contiguous (that is, direct) communication and contiguous indexical (that is, indirect) communication. For example, a shadow (index) can betray the presence of the invisible person (original) hiding behind a corner of a house: here despite the contiguous nature of the situation we are already dealing here with indirect rather than with fully contiguous, direct communication;
- Original, index, and image exist within the same temporal context, except that image is spatially displaced from original, as exemplified by tom-tom signalling

in tribal Africa, or by a telephone conversation, where the voice (index) can be heard (image) over the phone a long distance away from the caller (original). The same type of communication occurs during a live audio-visual satellite link in TV news bulletins, when a presenter in the TV studio can actually see (image) on the screen (index) an interviewee (original) situated in another place of the globe. This type of indirect interaction illustrates what can consequently be called *simultaneous indexical communication*. A full realization of simultaneous but spatially displaced communication has only become possible in recent times, thanks to the technological inventions of the last century such as the telephone, live television, and to some extent electronic mail and mobile phone text messaging;

- Image and index exist in the same spatio-temporal context, that is, they are fully contiguous, but index is spatio-temporally removed from original, as when a hunter perceives (image) a hoof print (index) of an animal (original) that has moved from the spot some time ago. Similarly, an old photograph, an archive voice recording, a documentary film, an old manuscript are all indexes that are spatio-temporally displaced from their originals. A wax cylinder, a vinyl record, a cassette tape or a compact disk are also indexes of an actual musical performance (original) from some time past. In fact, most indexes found in the empirical world are spatio-temporally displaced from their originals. Consequently, this type of indirect interaction illustrates what can be called *displaced indexical communication*.

Iconic communication

Indexical communication is still relatively close to direct, contiguous communication, in the sense that image indirectly interacts with original through index, which in the case of contiguous indexical communication for example is practically indistinguishable from direct interaction with original. But it is also possible to imagine a relation between image and original that is not based on physical interaction, direct or indirect, but on correspondence of information contained in original and image. In this situation it is the receiver, and not the sender as in indexical communication, which produces a change in the environment. This change corresponds with information contained in the original, but it is not physically caused by the original. It is as if, in the absence of any physical interaction with the sender (original), the receiver produced an image of the original to create a semblance of an interaction that does not exist. A physical change corresponding with original produced by the receiver in the environment will accordingly be called *icon*. In this situation sender and receiver do not exchange information by means

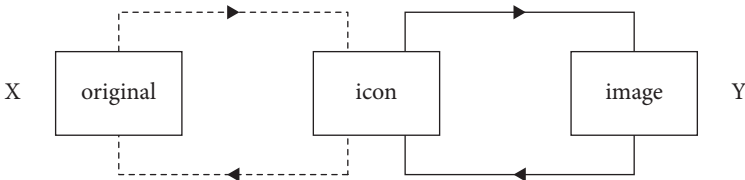


Figure 4. Correspondence of information (iconic communication) between original and image

of direct or indirect interaction, but only remain related to one another by means of a representation (icon) of original produced by receiver in the environment. This type of relation between systems will accordingly be called *iconic communication*, as represented graphically in Figure 4.

The relationship between original and icon is represented in Figure 4 by a dotted line to indicate that an icon is related to the original not through physical interaction, as in contiguous or indexical communication, but through correspondence of information, here defined as a *structural equivalency* between systems. For instance, in respect of external appearance a souvenir plastic model of the Eiffel Tower is structurally equivalent to the real Eiffel Tower, despite the difference in size and the material between the two objects. Structural equivalency is here achieved by a strong similarity (or identity) in the proportions of the parts in the toy model and in the real tower. The model is an icon of the Eiffel Tower also because – according to the definition – the model is not physically caused by the tower (original), but by receiver (here: a human being), who produces a model (icon) that is structurally equivalent with the original. When a structurally equivalent object is physically caused by original it is not an icon but an index, as when a new organism is created by partly copying the genetic material of its parents during sexual reproduction, or when a person has his or her photograph taken.

As I will discuss in greater detail in Chapter 5, the difference in origin between index and icon explains our differing responses to photography and painting (or drawing). In popular perception even a poor quality, black-and-white portrait photograph, badly framed, scratchy, grainy, and out of focus, is recognized as a more accurate and a more “real” visual representation than a well executed painted colour portrait of that person. This is because a photograph, being primarily an index, is physically if inadvertently caused by the photographed person (sender), while a painting, being primarily an icon, is caused by the artist (receiver), and it has no direct, physical connection with the represented object. This is why Oscar Wilde could write that “every portrait that is painted with feeling is a portrait of the artist, not of the sitter. The sitter is merely the accident, the occasion. It is not he who is revealed by the painter; it is rather the painter who, on the coloured canvas,

reveals himself” (Wilde 1994: 20). In other words, a photographic portrait is an index of the photographed person, while a painted portrait is an index of the painter. Index’s physical connection with sender rather than with receiver also explains why images of crime caught on CCTV cameras can be used as reliable evidence in court, whereas verbal reports or an artist’s drawn impressions of the same event do not constitute legal evidence and still require independent corroboration.

On the other hand when an icon is mistakenly regarded as an index of the object or person it depicts, it illustrates the phenomenon of idolatry, or homeopathic magic – a belief that an iconic representation, a painting or a sculpture for example, is somehow directly linked with the represented object. Idolatry in this sense can be found in the cult of religious images practised in Catholicism or in Eastern Orthodox Church, in which the deity represented in a picture or statue is thought to be connected with the deity believed to exist in the outside world. From a physical point of view, however, icon (unlike index) has no physical connection with original, existing independently from it in space and time. However, it may still be useful to distinguish the possible types of spatio-temporal relations between original and icon:

- Original and icon co-exist within the same spatio-temporal context, as is the case with a model sitting to have his or her portrait painted, or when a road sign with a schematic image of a roundabout is situated at the roundabout itself. This type of relation between original and icon illustrates what can accordingly be called *contiguous iconic communication*;
- Original and icon co-exist within the same temporal context, but not within the same spatial context, as when a person represented on a painted portrait is situated somewhere else than the portrait. All realistic art, beginning with the Upper Palaeolithic cave paintings, consists of icons that are spatially displaced from the original objects they represent. This type of relation between original and icon can be accordingly called *simultaneous iconic communication*;
- Original and icon are separated from one another in both time and place, as when a portrait painted years ago depicts a person who is now correspondingly older and is living in a place situated far from the portrait, or is no longer living. Most icons, such as those studied by art history for example, are spatio-temporally displaced from their originals. Consequently, this type of relation between icon and original illustrates what can be called *displaced iconic communication*.

Symbolic communication

It is also possible to imagine another kind of relation between original and image, again one not based on physical interaction, as in contiguous or indexical communication, and one not even based on correspondence of information between image and original, as is the case with iconic communication. In this new type of relation between original and image it is again a receiver that produces a change in the environment, except that this change does not correspond with information contained in original, as happens in iconic communication, but bears no formal or structural equivalency with original. In other words, here the relation between original and image is purely arbitrary, based on no physical or structural correspondence or similarity. For example, while in iconic communication a painted portrait (icon) can bear recognizable resemblance to the sitter (original), in the new type of relation information contained in the image would be totally unrelated to information contained in the original. Human verbal language and its external referents constitute probably the best example of this kind of relationship between original and image: a person's name, either in its spoken or written form, bears no formal or physical resemblance to the appearance or character of the person it is referring to. That is to say, a name is not an icon, still less is it a physical part of or an index of the person or object it denotes (barring occasional irrational, magical beliefs to the contrary, in which by manipulating the name one can supposedly manipulate the object). Consequently, a physical change structurally unrelated to but referring to original, produced by receiver in the environment will be called *symbol*. In this situation sender and receiver do not exchange information by means of physical interaction (as in contiguous or indexical communication), but only remain related to one another by means of a symbol produced by receiver, which refers to original in an arbitrary, structurally non-equivalent way. This type of relation between systems will accordingly be called *symbolic communication*, as represented graphically in Figure 5.

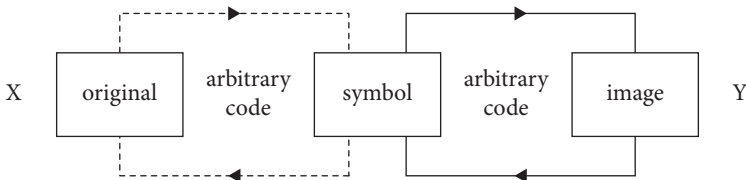


Figure 5. Arbitrary relationship (symbolic communication) between original and image

In Figure 5 the relationship between original and symbol is marked, as in Figure 4, by a dotted line to indicate that symbol is related to the original not through physical interaction, as in contiguous and indexical communication, and not even through correspondence of information, as in iconic communication, but in a purely arbitrary and unmotivated way. (In Figures 4 and 5 the dotted line connecting the intermediary system, icon or symbol, with original simply means that there exists no physical, causal connection between the two.) Thus symbol only refers to original in a conventional manner by means of an arbitrary code employed by receiver to connect original with image. *Code* is here understood as a method used internally by receiver to transform information contained in original into information contained in image. The most complex and most universal (among humans) arbitrary code is the verbal language, both in its spoken and, as in phonetic alphabets, written form. (To be more precise, speech is based primarily on arbitrary code, but with a strong admixture of iconic and indexical elements, as will be discussed in Chapter 9.) Other examples of predominantly arbitrary codes used in human communication include mathematical, chemical, and musical notations.

As with the earlier types of communication, it is possible to distinguish the following situations depending on spatio-temporal relations between original, symbol, and image:

- Original, symbol, and image co-exist within the same spatio-temporal context, as when two people are talking face to face. This type of interaction will accordingly be called *contiguous symbolic communication*;
- Original, symbol, and image exist within the same temporal context, except that image and symbol are spatially displaced from original, as exemplified by a telephone conversation. This situation was referred to earlier as an example of simultaneous indexical communication, but because speech as a person's index uses an arbitrary code this type of interaction can also be called *simultaneous symbolic communication*;
- Image and symbol exist within the same spatio-temporal context, that is, they are fully contiguous, but symbol is spatio-temporally removed from original, which is what happens when we are reading someone's letter, or listening to a voice recording. Consequently, this type of indirect interaction will be called *displaced symbolic communication*.

In the chapters that follow I intend to demonstrate that the distinguished types of communication: contiguous, indexical, iconic, and symbolic (in that order) broadly reflect the evolutionary sequence of communication systems found among living organisms, and are correlated with increasing levels of organization of the nervous system, from plants through animals to humans.

Parainformation as meaning

So far I have been describing theoretically the mechanics of interaction between systems in terms of exchange of information understood as a difference between physical states. The emphasis has been on how information is communicated between interacting systems, whether directly as in contiguous communication, or indirectly by means of indexes, icons, or symbols. But communication is as much about what happens between interacting systems, as about what happens *within* systems that exchange information. Indeed, it would appear that the type of communication involved (contiguous, indexical, iconic, or symbolic) depends on the internal structure and complexity of interacting systems, including not only the ability to produce and receive information, but also the ability to process that information internally, to interpret it, and to choose an appropriate reaction based on that information.

To account for the possibility of processing information internally by the system, let us extend the model of information as presented earlier in Figure 2. In this simple model information was defined as a difference between physical states (information I_x , or original, in reacting system X; and information I_y , or image, in receiving system Y). On the other hand communication was defined as a transformation of information between interacting systems; in other words, as a process of transforming originals into images. An interaction between contiguously co-present systems is the simplest type of communication, as illustrated by innumerable instances of direct interactions between particles and material objects in the universe, which constantly collide with one another exchanging information and energy. But let us assume that the structure of at least one of the systems involved, say that of receiving system Y, allows it to process the received information internally, as shown in Figure 6 (below).

In the schema system Y receives information I_y from system X, and it can react to this information not only through external feedback directed at system X, as in Figure 2, but also internally, by transforming image y_2 into image y_3 . This internal transformation of images also constitutes information, except that this new information is not communicated between systems X and Y, but is generated inside the receiver. To be more precise, this new information is prompted by the information received by system Y from system X, but it is not communicated between these systems, as Figure 6 illustrates. To account for this expanded version of the communication model, let us introduce a definition, whereby image that is not generated by original will be called *paraimage* (here: y_3), while information contained in images of which one is a paraimage will be called *parainformation* (Mazur 1970: 35; Sadowski 1999a: 52).

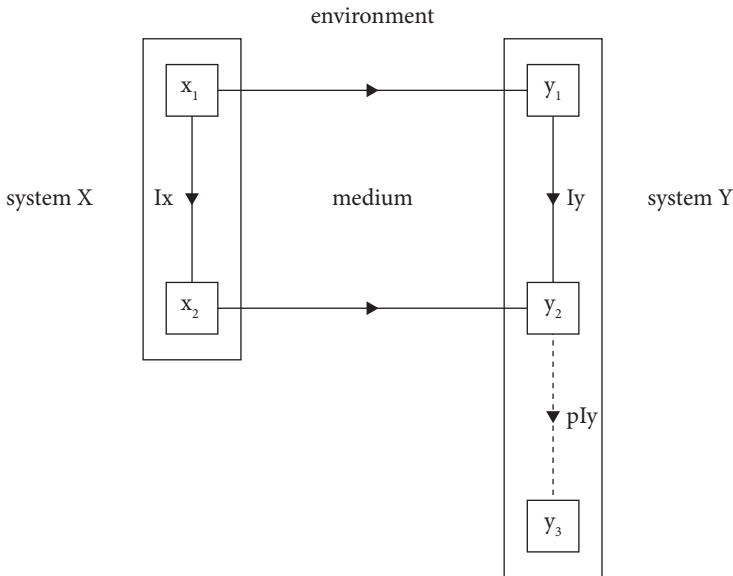


Figure 6. Parainformation as a reaction to information

Parainformation can therefore be understood as an internal association related to communicated information; in other words, as the *meaning* of information. Consequently, information with parainformation attached to it will be called *meaningful information*, while information on its own, with no parainformation attached to it, will be called *meaningless information*. For example, when a tree falls in the forest without any information-processing system such as a human observer present there to notice and interpret the fact, the event constitutes meaningless information. On the other hand when a forester finds a fallen tree and ponders what caused its fall, the event becomes meaningful information. In practice, information communicated between systems relates to the perception of some change occurring in the environment, whereas parainformation (meaning) generated within reacting or receiving system relates to the interpretation of that information. Thus for example a text written in Japanese characters presents meaningful information to a person able to read Japanese script, while for someone unable to understand written Japanese the same information is meaningless.

It is clear that not all empirical systems are capable of having associations about information; for this purpose a system must be equipped with an internal organ designed to receive, process, possibly store, and interpret information. For instance, inanimate objects such as minerals, while subject to internal chemical reactions and external mechanical forces, do not appear to purposefully transform or act upon received environmental inputs. Inorganic objects such as stones exist

inertly exposed to elements, with heat and frost eventually crumbling them into dust. On the other hand living organisms (that is, autonomous systems), even as relatively simple as bacteria or amoebas, react actively to received information to maximize their chances of survival and reproduction. Only autonomous systems, that is, systems capable of maintaining functional equilibrium in their interactions with the environment, are able to react to received information in their own adaptive interest, and are for this reason equipped with organs, such as the brain, for registering, storing, processing, and accessing desired information as the basis for adaptive behaviour. From relatively simple single-celled organisms right up to humans with their complex brains, autonomous systems in the empirical world are capable of using parainformation, that is, internal associations attached to perceived information, to interpret and appropriately respond to that information.

Plants for example possess specialized cells to perceive sunlight, temperature, moisture, or physical obstacles, and they can interpret and react to these inputs by modifying their behaviour: they can respond to the changes in the direction of sunlight by movement or by putting forth more leaves in sunny areas, they can put down roots to reach for moisture and other nourishment in the soil, or they can grow around obstacles that block their way to sunlight. However, as far as can be determined plants lack any means of storing information during their lifetime, and therefore they cannot learn. In animals in turn the ability to perceive relevant elements in the environment, especially those relating to nourishment, danger from predators, or mating opportunities, to interpret them correctly and to react to them in adaptively advantageous ways is correspondingly more sophisticated, supremely so in humans, whose brain, the most complex organ in the known universe, is specially designed by evolution to generate extensive and multifarious parainformation as the basis of socio-cultural behaviour.

Communicating meaningful information

Producing parainformation is not necessarily confined to the receiver, but can occur in the sender as well. In this situation the sender communicates information with parainformation already attached to it, as shown in Figure 7 (Mazur 1970: 47).

In this modified schema two autonomous systems interact by transforming original I_x in the sender into image I_y in the receiver. In addition to the information thus communicated between the two systems, both sender and receiver possess parainformation (pI_x and pI_y respectively), which is attached to information but is not communicated between the systems. In other words, while information is what systems exchange in the course of interaction, parainformation, or meaning, is the systems' internal reaction to the exchanged information.

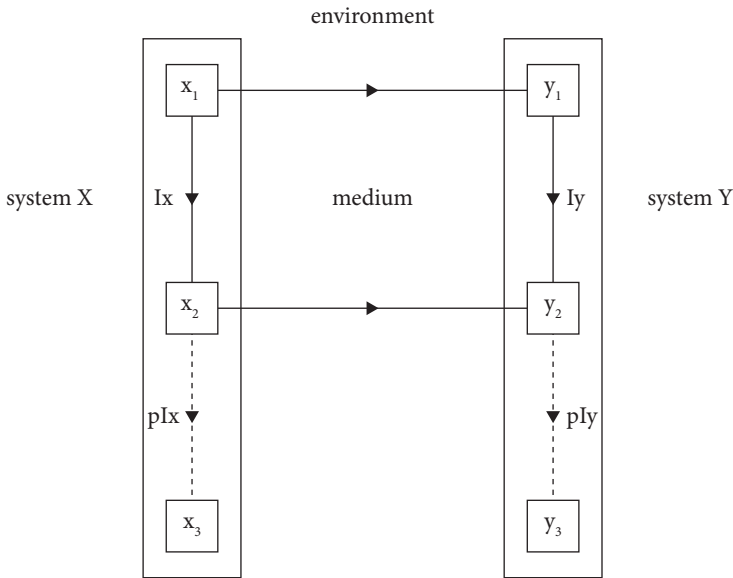


Figure 7. Parainformation in direct communication between autonomous systems

The situation described in Figure 7 is best illustrated by cases of direct, contiguous communication between autonomous systems, as when two animals face one another in the context of sexual or territorial rivalry. In such an interaction information relates to the animals' external, physical appearance and manifested behaviour: body size, movement and posture; the bristling of the hair; the size of mane, antlers, or teeth; grunting and growling sounds, and so on. On the other hand parainformation refers here to the animals' instinctive interpretation of the observed displays in the rival (as threat, aggression, or submission, as the case may be), to be used as the basis for adaptively appropriate behaviour (staying on guard, self-defence, attack, submission or escape). Much of human social interaction likewise consists of contiguous visual, auditory and other sensory communication involving perceiving and acting upon other people's bodily displays and signals.

To account for cases of indirect communication, including indexical, iconic, and symbolic types, we need to expand the model of communication from Figure 7 by adding an intermediary system, corresponding with the change in the environment produced either by sender (as in indexical communication), or by receiver (as in iconic and symbolic communication), as shown in Figures 3–5. This intermediary system (index, icon, or symbol) contains information that is often spatio-temporally displaced from the sender, while its meaning is determined by parainformation contained both in the sender and in the receiver. The full set of relations between information and parainformation involved in two autonomous systems engaged in indirect communication is shown in Figure 8.

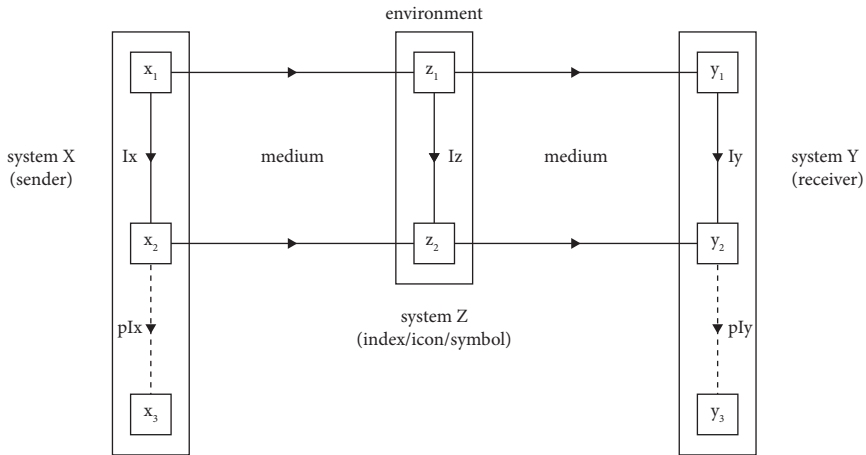


Figure 8. Information and parainformation in direct communication between autonomous systems

As the schema illustrates, in indirect communication information is in fact coded twice: firstly, when information I_x in the sender is coded into information I_z in the intermediary system Z (index, icon, or symbol); and secondly, when information I_z in the intermediary system Z is coded into information I_y in the receiver. It is this double coding that is responsible for the spatio-temporal displacement often occurring between original and image in indirect communication. More specifically, in indirect communication original I_x is first coded into image I_z , and then image I_z becomes an original coded into image I_y . Thus for instance in indexical communication an animal's hoof (original I_x) leaves an impression in the ground (image I_z), which later becomes an original (I_z) perceived as image (I_y) by a hunter. If the hunter possesses the relevant parainformation relating to this index, he is able to identify the species, possibly the size and weight of the animal, and other features such as the time that has elapsed since the animal made the hoof print in the ground and so on. A person without the right kind of parainformation would either misinterpret the hoof print, by relating it to the wrong species for example, or would even miss the mark left by the animal in the ground altogether.

In iconic communication, to use another example, an artist (for instance Canaletto) produces a realistic painting of, say, the Basilica of San Marco in Venice, and a viewer familiar with this building (that is, possessing the relevant, specific parainformation) will be able to recognize it correctly from the painting. On the other hand, a viewer unfamiliar with the Basilica of San Marco in Venice but familiar with the design of Christian basilicas in general (less specific parainformation) may still identify the painting as representing a church of some description. Fi-

nally, a person completely unfamiliar with the appearance of Christian churches (no relevant parainformation) will not recognize the painted building as a religious structure at all. In all cases the information presented in the icon is the same, while the meaning of that information varies depending on the type and extent of the individual viewers' parainformation associated with that information.

In symbolic communication, best represented by human verbal language, a speaker's/writer's meaning (parainformation) is first coded into an utterance/written text, which is then decoded by a hearer/reader possessing the right kind of parainformation. Linguistic communication cannot take place without both communicators sharing the same ethnic language, that is, having the same basic knowledge of the grammatical rules combining specific patterns of articulated sounds with specific conceptual associations (parainformation). A person unfamiliar with a particular ethnic language (that is, without the right kind of parainformation) will perceive the speech sounds only as meaningless acoustic sensations, without being able to identify the meaning coded into those sounds by the speaker.

The systems model of communication involving information and parainformation can also help clarify some of the traditional problems related to meaning produced not only in spoken language but also in literary texts and visual arts. One question is what constitutes meaning in a particular case, and another is *where* that meaning is to be found: in the acoustic features of a spoken utterance; in the graphic form of letters of a written text; in the shapes, colours, and lines of a visual image; in the mind of the speaker, writer, or painter; in the mind of the listener, reader, or viewer; or outside all these in the sphere of language or culture understood as a collective generator of all meaning. For example, nineteenth-century criticism tended to regard the artist's mind and unique life circumstances as solely responsible for the ultimately elusive (because inaccessible to the receiver) meaning of a work of art, while the work itself was perceived mainly as an outward expression and a vehicle of the author's mind, which existed largely independently from the historical moment and socio-cultural conditions of life. Neither was the receiver's personal response regarded as relevant to the meaning of the work under scrutiny – the latter was determined solely by the author's unique, elusive, mysterious and ahistorical genius.

As a reaction to this author-oriented, or biographical approach to art and literature, the early twentieth-century school later known as the New Criticism shifted the emphasis from the author's mind to the properties of the work itself (the intermediary system), now regarded as the sole carrier of meaning (aesthetic, philosophic and so on), quite independently from the author's possible intentions or the receivers' personal interpretations. The New Critics thus focused on the literary texts' organic form, their imagery, style, characterization, patterns of metaphor, diction and so on. Later in the century, as a reaction to this text-oriented

criticism, the postmodern interpretive schools shifted their attention both from the author and from the text onto the receiver, whose own associations, as defined by the socio-cultural determinants of gender, class, race, or by the unconscious, were now deemed solely responsible for the work's meaning. In postmodern criticism authorial intention considerably diminishes in importance while the author, although not completely "dead," is seen merely as one link in a much larger context of social exchange of meaning – a transmitter of meaning rather than its generator. Nor is the artistic work itself treated now as the source of its own meaning, but more as a kind of black hole inviting and accommodating any kind of meaning imposed upon it by the receiver (Dickstein 1992). How can these divergent views, one seeking the meaning in the sender, another in the work as the intermediary system, and still another in the receiver, be reconciled?

As is clear in Figure 8, the intermediary system Z (a spoken utterance, a literary text, a painting *etc.*) on its own represents information, while the meaning of that information is determined by parainformation, that is, by internal associations attached to perceived information by sender and receiver (Sadowski 1999a: 54–57; 2000b). If meaning is equivalent, as I propose it, with parainformation, then it must exist *outside* information (literary text or painting) in sender's and receiver's minds, although it is *prompted by* that information, because the nature of parainformation is such that it cannot exist independently from information. Rather, parainformation is a reaction to information, and in this sense it is partly influenced by it. That is to say, meaning is neither to be found in information itself (which means that a written text, a spoken utterance, a painting and so on do not *contain* meaning), nor does meaning exist independently from information, in the sender's and receiver's brains, without being triggered and in consequence affected by information, that is, by the physical properties of an utterance, of a literary text, a work of art and so on.

For example, a reader generous and patient enough to have read my book this far will probably agree that it deals with communication, and not for instance with migration of birds, prevention of cancer, or Italian cuisine. What narrows the reader's interpretation of my book down to the problem of communication is my specific choice of words and syntactic structures, because a different selection of words and syntax would provoke different semantic associations (parainformation) in the reader's mind. It is another way of saying that information (here: words printed on a page) is not a kind of black hole that will absorb and accommodate any interpretation imposed upon it, as deconstructive critics for example appear to imply, because the physical properties of information as selected by sender constrain the possible choice of meaning, limiting it to what is consistent with authorial intention. Thus neither the old biographical criticism nor the aesthetically-oriented New Criticism were completely right, although the two schools were both

partly right: the meaning of a work of art exists neither solely in the author's mind nor solely in the work itself, but results from an interaction between the two. In other words, beauty is neither an exclusive attribute of a work of art, nor does it depend solely on the author's intention, nor does it exist only in the eye of the beholder; rather, a sense of beauty (or any other relevant meaning) is negotiated in the course of an interaction between the physical properties of the work (information) and the receiver's perception and thought processes (parainformation), informed by such internal factors as aesthetic sensitivity, knowledge of artistic conventions, and assumptions about the author's possible intention.

Meaning and significance

Since in the simplest case communication always involves at least two systems, sender and receiver, we are effectively dealing with two types of meaning: one generated by the sender's parainformation, the other by the receiver's. Let us acknowledge this distinction by introducing a definition, whereby parainformation in the sender will be called *meaning*, while the corresponding parainformation in the receiver will be called *significance* (Sadowski 2001a). The distinction is analogous to the one made in 1967 by the literary critic E. D. Hirsch, Jr., who spoke of meaning as a determinate and permanent aspect of the text, corresponding ultimately with the author's original design, and of significance as a changeable, relative dimension of the text, defined in terms of critical response (Hirsch 1967: 57, 62; 1976: 79). Hirsch's distinction in turn corresponds with Karl Bühler's influential organon model of language formulated in 1934, in which meaning (the sender's parainformation) refers to the expressive function of communication, whereas significance (the receiver's parainformation) relates to the "appeal" function of communication (Bühler 1978: 24). It remains up to the student of communication, be it a linguist, a literary, cultural, or art critic to decide which of the two types of meaning is to be regarded as the more important: the problem ultimately boils down to the traditional dilemma of weighing one's own individual response (significance) against the speaker's/author's possible intention (meaning). The systems model of communication does not postulate in favour of either type of interpretation, although it makes it clear that the two kinds of meaning are of necessity always there. In other words, the sender, or author, can only be "dead" for a critic interested primarily in the significance rather than in the meaning of a work under investigation. The one important practical thing that can be said for the receiver-oriented, subjective response is that the receiver's own parainformation is for obvious reasons directly accessible and clearly identifiable while the sender's is not, and therefore significance is the only type of meaning that a critic can say anything

credible and direct about. At the same time exclusive preoccupation with significance, that is, with one's subjective response, at the expense of the author's possible if elusive meaning often leads to idiosyncratic and not always relevant interpretations, as evidenced for example by deconstructive analyses of literary works (Abrams 1977: 429).

Someone else's parainformation may for obvious reasons be inaccessible, and any speculation about its nature and extent will always remain conjectural, but it does not automatically follow that all meaning is unstable and indeterminate, and that communication based on mutual understanding is therefore impossible, as argued again by deconstructive critics. In fact, deconstruction appears to be caught up in what Raymond Tallis calls pragmatic self-refutation, in that the claim about the instability of meaning is automatically undermined by the very fact of making such a claim, that is, of positively communicating it to the readers and hoping that it would be understood as intended by a critic making the claim (Tallis 1995a: x-xii). Notwithstanding the unduly pessimistic and in fact illogical claims regarding the alleged indeterminacy of meaning, in most cases of direct and indirect communication we are always dealing with at least a partial overlap of parainformation between interacting systems, that is, with a considerable degree of mutual understanding. Indeed, without some degree of compatibility of parainformation and the resulting level of predictability of reactions between interacting systems, communication as part of a purposeful, adaptive behaviour of autonomous systems would make no practical sense, and would simply have never been invented. For instance, to find a mate an animal must send the right signals of sexual display to be correctly interpreted and appropriately responded to by a prospective partner to insure eventual reproductive success. In the human world too social relations, relying so much on mutual understanding and co-operation between interacting people, would simply disintegrate and collapse if no one ever understood what everyone else meant in their spoken, written, or visual communication. But since full compatibility of parainformation in communication is clearly not always the case, let us enumerate the types of situations theoretically possible between interacting systems:

- Parainformation in the sender (meaning) and parainformation in the receiver (significance) are identical. A full overlap of parainformation occurs for example when two conversing persons share the same ethnic language and agree upon the basic denotations of the words and phrases they are using. Or when the meaning of road signs as stipulated by traffic authorities is precisely the one adopted by the road users. Identity of parainformation in interacting systems will accordingly be called an *understanding* between those systems;
- Parainformation in the sender (meaning) and parainformation in the receiver (significance) are different, involving the following possible situations:

- the sender possesses parainformation, but the receiver does not possess parainformation relating to communicated information. This happens for example when a person is confronted with an unfamiliar language, or when the denotations of some words in one's native language are unknown to the hearer/reader (due to gaps in education for instance), or when a person unfamiliar with road signs is unable to interpret the meaning of those signs. Lack of parainformation in the receiver to match the parainformation in the sender will be called *incomprehension*;
- the sender does not possess parainformation relating to communicated information, but the receiver does. This occurs when someone uses foreign words without understanding their meaning, to impress others for example (*vide* the malapropisms of Del Boy's French phrases in the BBC sitcom *Only Fools and Horses*), while the hearer is able to correctly identify the meaning of these words. Or when someone's unintentional behaviour (an accidental gesture, facial expression, or bodily posture) is interpreted by an observer as carrying some specific intentional meaning. Lack of parainformation in the sender to match the parainformation in the receiver will be called *overinterpretation* (or what Raymond Tallis calls "overstanding");
- both the sender and the receiver possess parainformation relating to communicated information, but it is in each case different. For instance, in some cultures a nod of the head means "yes," and in other cultures it means "no." A word spelled "but" is a co-ordinating conjunction in English, whereas in Polish it means "a shoe." Lack of correspondence in parainformation between interacting systems will be called *misunderstanding*.

A single instance of communication (a single index, icon, or symbol) will always illustrate one of the above situations, that is, it will either represent understanding, incomprehension, overinterpretation, or misunderstanding. On the other hand a series of interactions between two systems sustained over time may involve one, more than one, or all of the above-mentioned communicative situations. It is also possible to reserve the term "communication" for instances of understanding, that is, for situations of full compatibility of parainformation between interacting systems, and to use the term "miscommunication" in relation to instances of incomprehension, overinterpretation, and misunderstanding, that is, to situations of incompatibility of parainformation between interacting systems (Sadowski 2001a: 295–300).

Deception

Autonomous systems in the empirical world nearly always exist in the context of limited resources needed for survival, the fact that necessitates both co-operative behaviour based on communication, and competitive behaviour based on intentional avoidance of communication, on suppression of information, as well as on misrepresentation of information, especially that relating to the access to such vital resources as food and mating opportunities. As Marc D. Hauser points out, conveying accurate information can sometimes work against the animal's fitness, so in competitive situations signals can be designed to manipulate the behaviour of receivers by concealing information or by falsifying it (Hauser 1998: 28; Trivers 1990: 45). In the human world the possibilities and opportunities for withholding or misrepresenting information in competitive social situations are – as we know – much broader, and our extraordinary skills at lying and deceiving are simply all-too-familiar facts of life.

Deception can be an advantageous strategy from an adaptive point of view also because dishonest, or meaningless, information is often less costly to produce than honest, meaningful information. Lying for example involves practically no cost at all (provided one is not found out), whereas truthful information always requires factual or material evidence to back it, which may be difficult to procure. One would also expect, especially in a cognitively sophisticated species such as ours, a strong selective pressure to recognize cues of dishonesty, simply as a way of avoiding being cheated and taken advantage of. In other words, our minds may be designed both to communicate meaningful information and to cheat (on occasion), as well as to be able to detect cheating in others (Hauser 1998: 604, 607). As the anthropologist Terrence Deacon also points out, the complementary pressures cause both deception and detection adaptations to escalate over the course of evolution. Where the potential for inaccurate assessment of the competitors' phenotypic quality such as strength or reproductive fitness is high, and the potential costs of misjudgement or the advantages of deception are also high in reproductive terms, the evolutionary dynamic will tend to produce increasingly more elaborate and more complex forms of communication. Pair-bonding species, such as higher mammals, apes, and humans, are therefore under pressure to be able to assess accurately each other's physical condition, resource defence capabilities, care-giving abilities, likely fidelity and so on (Deacon 1997: 383). In view of these selective pressures let me introduce a definition, whereby the behaviour of a system designed to present miscommunication as communication to another system will be called *deception*. Deception is not the same as miscommunication, because the latter relates to a lack of communication (due to incompatibility in parainformation) between systems intending to communicate, whereas deception refers to

a lack of communication between systems of which at least one does not intend to communicate, that is, to convey meaningful information. It is consequently possible to distinguish the following types of deception:

- Sender (deceiver) produces information with no parainformation attached to it (meaningless information), in such a way as to provoke the desired parainformation in the receiver. The most common example of this kind of deception in human communication is lying, that is, making positive statements about non-existent state of affairs relating either to the external world (as in describing objects and events that do not exist), or to the system's internal states (as in signalling absent emotions or intentions). Deception of this type presupposes a certain level of cognitive flexibility, found already in primates, and involves highly intentional behaviour and the ability to read others' minds to manipulate their behaviour. Research on animal deception suggests, however, that physiological reactions rather than high cognitive faculties dictate most animals' deceptive behaviour (Hauser 1998: 586; Dunbar 2005: 62). For instance, some mammals and primates cheat by instinctively bristling their hair when they are aggressive, to increase their apparent body size and to scare the opponent. Similarly, vervet monkeys and other primate species have been reported to use alarm calls in the absence of any predator – a deceptive behaviour designed to distract other monkeys from aggressive intentions or to remove potential competitors from a source of food (Bickerton 1990: 14). Using false alarm calls has also been observed among birds: for example, in mixed-flocks members of a sentinel species would sometimes emit an alarm call when in direct competition with birds of other species for a particular prey item. In many cases there was no predator present, and when the other birds took anti-predatory action, the individuals who gave the spurious alarm calls were able to catch the insects for which there were competing. These “false alarms” work because the costs of ignoring a threat far outweigh the benefits of eating a bug (Allen and Saidel 1998: 194). To sum up: a form of deception in which the sender provokes parainformation in the receiver by means of information that has no parainformation attached to it will be called *fabrication*. Put simply, fabrication is presenting meaningless information as meaningful information;
- Sender (deceiver) produces information with parainformation attached to it (meaningful information), but does not communicate this information to the receiver. A common example of this kind of deception in the animal world is camouflage (also used by humans in warfare), which is designed as a way of escaping the notice of predators/enemies by making the deceiver blend visually with the surroundings. Failing to produce relevant documents, concealing evidence, keeping silent about important facts and so on are familiar examples

of this kind of deception practised among humans. Animals too can intentionally “keep silent”: in some bird and mammalian species individual animals have been observed to call other group members in the context of food less often than one would expect, suggesting the possibility that intentional suppression of calls is taking place to reduce feeding competition (Hauser 1998: 571). Consequently, failure to communicate meaningful information will be called *suppression*. This kind of deception can take simple forms such as hiding to avoid predation, a behaviour practised by most animals, or it can assume more sophisticated expressions: among gorillas, for instance, individual females have been observed on occasion to copulate secretly with a young male, hidden from the view of the dominant male. The clandestine gorilla lovers can even suppress the cries that normally accompany the sexual act. Subordinate males also hide their erections behind their hands when their courtships are interrupted by dominant males (Mithen 1999a: 83; Cartwright 2000: 180; Cummins 1998: 37);

- Sender (deceiver) produces both meaningful information without communicating it to the receiver, and meaningless information which it does communicate to the receiver. In other words, in this communicative situation the sender manipulates the receiver into accepting meaningless information in the place of meaningful information. For example, some wasp species lay their eggs in anthills, and despite the fact that the wasps’ eggs are larger and of a different colour than the ant eggs, the wasps’ eggs deceptively secrete the same pheromone (smell) as the ant eggs, and are looked after by the ants as if they were their own eggs. When the wasps’ eggs hatch, the larvae feed on the ants’ eggs. A similar deceptive behaviour is practised by the cuckoo, which proverbially lays its eggs in the nests of other birds. A variety of species, including snakes, can also mislead potential predators by playing dead. Here the suppressed meaningful information is the fact that the snake is alive, while the communicated meaningless information is the pretence that the snake is dead. As is vividly illustrated by David Attenborough’s wonderful BBC nature programmes, deception and exploitation are simply the order of the day in the animal kingdom.

Combining suppression and fabrication in one communicative act is abundantly illustrated by human deceptive behaviour, as in using decoys in espionage and warfare, forging documents or works of art, playing confidence tricks, creating diversions, bluffing and so on. This kind of deception (combination of suppression and fabrication) will accordingly be called *substitution*. The archaeologist Steven Mithen hypothesizes that the white-skinned Neanderthals, our human relatives who became extinct some thirty thousand years ago, used natural pigments to

camouflage their bodies while hunting big game (Mithen 2005: 223). A spectacular example of substitutive deception from more recent times are the proverbial Potemkin's villages. In 1787 Field Marshal Prince Gregory Potemkin organized a river journey down the Dnieper for the Russian Empress Catherine and her court. His aim was to prove his success in colonizing the province, recently wrested from the Turkish Ottoman Empire. Potemkin assembled a number of mobile "villages," each located at a strategic spot on the river bank. As soon as the imperial barge hove into sight Potemkin's men, all dressed up as jolly peasants, raised a hearty cheer for the Empress and the foreign ambassadors. As soon as the barge turned the bend, they stripped off their caps and smocks, dismantled the sets, and rebuilt them overnight further downstream (Davies 1997: 658). The communicated meaningless information was the pretence that the region along the Dnieper was fully Russified, whereas the suppressed meaningful information was that the region was in fact ethnically Ukrainian.

It might appear that deception presupposes more advanced cognitive faculties than those needed for "honest" communication, as it assumes a system's awareness of other system's internal states, what psychologists call "theory of mind" (Workman and Reader 2004: 126, 360). On the other hand in most animals deceptive behaviour may be due simply to trials and errors of natural selection, whereby an organism, such as a stick insect for example, stands better chances of surviving and reproducing by developing an ability to blend with its surrounding rather than remaining visible to potential predators. A higher survival rate of camouflaged insects will ensure that their "camouflaging" genes will be passed on to the next generations, thereby increasing their chances of survival. Deceptive suppression of meaningful information does not therefore require advanced cognitive faculties; indeed hiding for instance is a universal adaptive behaviour in all species, from insects to humans, as an instinctive reaction to avoid danger.

Self-deception

While deception is often advantageous as a strategy to outwit competitors or enemies, it is also possible to imagine situations, especially those involving systems with advanced cognitive faculties such as humans, where not only deceiving others but also deceiving oneself can be a viable adaptive strategy. This seems paradoxical, because if internal representations of the world are to aid in the system's survival, they clearly should reflect the world accurately, allowing for correct assessment of possible dangers and/or opportunities to prompt appropriate, adaptive reactions. In other words, requirements of homeostatic self-regulation would indicate that the system's internal representations reflect the world as it is, while false representations, by

virtue of their possible counter-survival value, should be selected out in the course of the system's evolution. This indeed may be the case in the animal kingdom, where any mistake, any wrong assessment of impending danger usually has immediate fatal consequences, eliminating the careless animal from the genetic pool forever, thus reducing the risk of similar mistakes occurring in the future. The evolutionary process rewards therefore faithful representations of reality with survival, while eliminating unfaithful images of reality because of their low survival value.

In this context the human species is probably unique in the natural world in possessing an extraordinary capacity for self-deception, by producing in abundance descriptions and explanations of the world that evidently do not reflect what the world is like from an empirical point of view. What is widely regarded as the most important distinction between humans and other animals – the presence of reflective consciousness, language, and culture – appears to be responsible for representations of the world, as exemplified by religion, mythology, philosophy, art and literature – the so-called “spiritual culture” – which, interestingly, for the most part appears to represent the external world not as it is, but as it evidently is not. The supernatural beings that populate religions: gods, spirits, angels and demons; the fantastic creatures of myths and fairy tales: hobgoblins, nymphs, satyrs, unicorns and so on; stories of magic describing events and phenomena that defy physical laws: flying carpets, shape-shifting magicians, caps of invisibility, weightless angels and so on; religious cosmologies with their fantastic paradises and hells; the speculative and unproven explanations of the world devised by philosophers; myths of national destiny concocted by political demagogues; and the idiosyncratic, subjective world-visions spun by poets, writers of fiction, and other creative artists – for all their stimulating, emotive and entertaining quality are nonetheless remote from the empirically verifiable representations of the universe such as those produced by scientific observation. The persistence and universality of these fictitious descriptions in human culture no doubt testify to some deeply seated psychological and social needs for individual and collective supra-realistic representations of the world, but that need in itself is no proof of the objective veracity of these self-deceiving representations.

Another word for self-deception as a peculiarly human phenomenon is *faith*, understood as a strong and unshakeable conviction, unsupported by any proof or evidence, in the existence of non-empirical systems. In view of the likely counter-survival value of false representations of the world an important question arises concerning the origin and reasons for the persistence of faith in the above sense in human psychology and social behaviour, not just in numerous small self-delusions that individual people live by but more significantly in the grand illusions of religions, philosophies, and political ideologies produced by human societies throughout history. The problem of human false representations of the world is fascinating

from an evolutionary point of view, because on the face of it such representations should contribute nothing to human survival. Among animals any inappropriate reaction to an important environmental stimulus, caused by a freak genetic mutation for example, in most cases leads to immediate fatal consequences, preventing the non-adaptive mutation to be inherited by subsequent generations. In other words, while there seems to be room for some degree of behavioural flexibility in the ever-changing circumstances of life, nature basically does not encourage unbridled creativity, inventiveness, and experimentation in animal responses to the environment. Why humans generally have not only got away with their unique imaginativeness but are actually thriving by it is a problem that will be addressed separately in Chapters 10 and 11: it would appear that human fictions and fantasies do produce some benefits after all that outweigh the disadvantages that false representations of the world otherwise incur.

As was the case with deception, self-deception can assume the form of fabrication, when a self-deceiver produces meaningless information, convincing himself that it is meaningful (as in paranoia, delusions, and hallucinations); suppression, when a self-deceiver convinces himself that meaningful information does not exist (as in self-denial); and substitution, when a self-deceiver suppresses meaningful information and produces meaningless information in its place (for instance, as in refusing to accept the death of a beloved person, believing that the person is still alive; or in dismissing empirical evidence that contradicts one's religious beliefs).

Metainformation as implied meaning

The model of communication involving information and parainformation as presented in Figure 8 is general enough to account for interactions between autonomous systems of varying structural complexity, from single-celled organisms to humans. It might appear therefore that differences between autonomous systems in the natural world are only quantitative, so that in principle both the amoeba and the chimpanzee for example are capable of interpreting environmental stimuli by activating their parainformation, except that in the chimpanzee the sensory apparatus and cognitive associations attached to perceived information are comparatively more varied and more extensive. As I also suggested earlier, it is possible to grade the distinguished types of communication following the progression from contiguous, through indexical, iconic, to symbolic types, on the assumption that this progression reflects the evolutionary sequence from simpler to more complex living systems. Thus it could be argued that it takes a more sophisticated nervous system to perceive and interpret iconic or symbolic information than indexical or contiguous information, just as it may require a more complex nervous system to

use deception or resort to self-deception in certain situations. Still, the differences in the types of communication involved and in the corresponding complexities of the nervous systems may appear at first sight to be ones of degree rather than of quality, suggesting among other things that human culture may represent a quantitative extension of animal behaviour rather than a qualitatively different and entirely new phenomenon. I will address the problem of the possible uniqueness of human consciousness and culture in Chapter 4.

Let us return to the earlier model of communication involving information and parainformation (Figure 8). According to the schema the meaning of information is generated both in the sender and in the receiver in the form of associations (parainformation) that both systems produce as reactions to information. But let us assume that at least one or both of the interacting systems are capable of producing associations attached not just to perceived information, as in parainformation, but to parainformation itself, that is, to internal associations, as illustrated in Figure 9 (below).

In this new situation the sender is able to transform paraoriginal x_3 into a new original x_4 , while the receiver is able to transform paraimage y_3 into a new image y_4 . These internal transformations of originals and images create a new type of information which, similarly to parainformation, is not coded between the two systems. To account for this expanded version of the communication model let

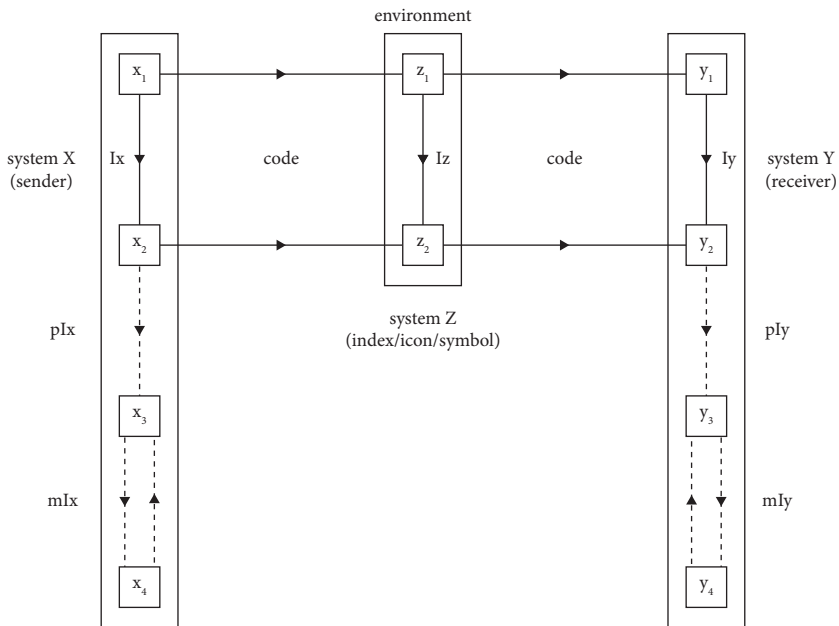


Figure 9. Information, parainformation, and metainformation in indirect communication between autonomous systems

me introduce a definition, whereby an original created in the sender by a transformation of paraoriginal will be called *metaoriginal* (x_4), while information created in originals of which one is a metaoriginal will be called *metainformation* (mIx). Similarly, an image created in the receiver by a transformation of paraimage will be called *metaimage* (y_4), while information created in images of which one is a metaimage will also be called *metainformation* (mIy). Or, to take account of possible differences in metainformation in interacting systems, metainformation in the sender will be called *metameaning*, while metainformation in the receiver will be called *metasignificance*. Also, both parainformation and metainformation will accordingly be referred to as *levels of meaning*.

If metainformation is to constitute a new type of meaning and not just a quantitative extension of parainformation, it has to be related to parainformation through negative feedback, that is, through opposition, as is indeed marked in Figure 9 by feedback loops linking paraoriginal x_3 with metaoriginal x_4 in system X, and paraimage y_3 with metaimage y_4 in system Y. This means that metainformation can be prompted both by parainformation, and therefore indirectly by received information, and homeostatically by the system itself, quite independently from any external information, as a result of the system's internal self-regulation. In the former case metainformation can be said to be referential, in the sense of relating indirectly to some environmental input, while in the latter case metainformation can be said to be representative only of the system's own inner states, as in dreams, creative imagination, delusions or hallucinations. In the case of hallucinations the internal stimulus is so strong that it turns images into supposed originals – the reverse of the usual perceptual process. In other words, in hallucinations mental impressions are subjectively converted into external perceptions.

While parainformation must always accompany perceived information as an immediate reaction to it, metainformation does not therefore require any external impulse because – as said above – it can be prompted from within the system itself. That is to say, if parainformation is an association evoked by perceived information, metainformation is an association prompted by another association. Or if parainformation is the meaning of information, metainformation is the system's reaction to that meaning in the form of reflection, commentary, self-analysis, irony and so on. Also, by virtue of being prompted internally rather than by an external stimulus, metainformation is not as constrained as is parainformation by the physical properties of perceived information, but can be freer, less predictable, more elusive and subjective. The distinction between parainformation and metainformation is thus analogous to what is often referred to as literal and metaphorical meaning, explicit and implicit meaning, or denotation and connotation, respectively. Derek Bickerton also uses the expression “on-line thinking,” or primary representations, practised by animals, here corresponding with parainformation, and

“off-line thinking,” or secondary representations, characteristic of human language, speculative thought, fantasy, and so on, here corresponding with metainformation (Bickerton 1990: 58).

The three main levels of human interaction with the environment denoted by the terms “information,” “parainformation,” and “metainformation” also appear to be compatible in the main with Karl Popper’s theory of the “three worlds.” For Popper “world 1” is the world of physical facts existing independently from but perceivable by the mind (information); “world 2” refers to our conscious experience of world 1 (parainformation); while “world 3” consists of “the logical contents of books, libraries, computer memories, and suchlike” (i.e. metainformation coded in permanent linguistic artefacts). All animals belong to world 1 and 2, whereas humans also partake of world 3, which includes theoretical systems such as science, philosophy, or myth. Popper’s world 3 is largely autonomous, but it feeds back on world 2, and even indirectly on world 1, because human conscious subjective knowledge (world 2 knowledge) depends on world 3, that is, on linguistically formulated theories. Language as used in every-day communication is accordingly a world 2-phenomenon, while the argumentative (meta-) function of language belongs to world 3 – both are for Popper “the most important functions or dimensions of the human knowledge, which animal languages do not possess” (Popper 1979: 74, 106, 119, 122; Altman 1967: 356).

In Popper’s formulation the three worlds are related in such a way that the first two can interact, and the last two can interact: “Thus the second world, the world of subjective or personal experiences, interacts with each of the other two worlds. The first world and the third world cannot interact, save through the intervention of the second world.” The second world of subjective and personal experience, corresponding with parainformation, is thus the mediator between the first (information) and the third (metainformation), so that

the human mind can see a physical body in the literal sense of “see” in which the eyes participate in the process. It can also “see” or “grasp” an arithmetical or a geometrical object; a number, or a geometrical figure. But although in this sense “see” or “grasp” is used in a metaphorical way, it nevertheless denotes a real relationship between the mind and its intelligible object, the arithmetical or geometrical object; and the relationship is closely analogous to “seeing” in the literal sense. Thus the mind can be linked with objects of both the first world and the third world (Popper 1979: 155).

In this way the third world of metainformation can exert an impact on the first world of perceived material things, not only in changing it, as evidenced by the transformation of the natural environment through farming over ten thousand years ago, but also by creating it, as evidenced by the influence of construction

industry and science-based engineering on creating an entirely artificial living environment of modern cities.

Parainformation, that is, literal, explicit, denotative meaning is used in practically all forms of communication, especially when exact and unambiguous understanding is required, as in animal communication, where clear, automatic (instinctive) understanding of environmental inputs relating to adaptively important situations is obviously critical for survival. Much of what constitutes human communication also relies on parainformation because, as said earlier, without clear understanding of specific intended meanings in defined social contexts co-operation over collective tasks and consequently social cohesion would be impossible. Office memos, instruction manuals, scientific and medical reports, legal documents, telephone directories, cookery books, bank records, purchase receipts, tourist guidebooks, road signs, military commands and so on are all examples of human communication based on parainformation, that is, on denotative, explicit, literal meaning shared by all people involved in situations where mutual understanding and agreement are necessary, and without which the social fabric would quickly disintegrate and human co-operation over even the simplest undertakings would be impossible.

On the other hand metainformation, that is, the metaphoric, implicit, and connotative meaning involves a mental capacity to generate spontaneous associations not necessarily tied to external information, and therefore free from the physiological constraints of perception and from the physical properties of the observed empirical world (Holyoak and Thagart 1995). Unlike parainformation therefore, metainformation is often characterized by suggestiveness, elusive indefiniteness, and vagueness. As in John Keats's poem, "Heard melodies [parainformation] are sweet, but those unheard [metainformation] are sweeter" (Keats 1992: 203). Also, because of its detachment both from perception and from the requirements of direct, immediate communication, metainformation can be spatio-temporally unrelated to adaptively relevant problems and situations that it is the role of parainformation to deal with. The elusiveness of metainformation is also caused by its highly individual and subjective character, not always linked to socially agreed meanings, the fact that often makes mutual understanding difficult or impossible. While the probability of a full overlap of parainformation in systems communicating in certain stereotypical social contexts can be high, communicating one's subjective and highly individualized metameaning to other people is often frustratingly difficult. Thus for example a factual, matter-of-fact biography, or a professional CV are meant to provoke clear and unambiguous understanding of the relevant facts from one's life (parainformation), while a poetic, literary account of one's life experience, as in the *Bildungsroman*, full of hints, suggestions, metaphors, and allusions to one's subjective perceptions, impressions, and

emotions relies too much on the author's elusive and personal metainformation to be fully understood by the receiver.

While having associations about perceived information is what all autonomous systems equipped with a nervous system are capable of, to be able to entertain associations about associations; in other words, to formulate views, opinions, and judgements about one's perceptions and responses presupposes a more advanced information-processing organ, in the natural world probably found only in the human brain. As Steven Pinker observes, in human linguistic communication the decoding of the literal information forms just the first step in a long chain of inference, by which we try to guess what the speaker wants us to think he or she is trying to say. So, for example, when Marsha says "I'm leaving," John asks "Who is he?" (Pinker 2003: 168). This kind of metacommunication is probably unattainable to non-human animals. While some of them are capable of using vocal signals to warn one another about an approaching predator for example, for all we know animals cannot use such signals outside the immediate adaptive context. Even the earlier quoted example of the vervet monkeys faking alarm calls to gain access to food illustrates utilitarian communication (here: deception) based on parainformation. One somehow does not expect an animal, even as intelligent as a dolphin, to send a warning signal to its conspecific saying something like "Watch out, a shark!", and then to send a disclaiming signal saying something like "Got ya, I was only kidding."

At the same time the linguist Stuart A. Altmann does suggest the presence of rudimentary metacommunication among some nonhuman primates, which appear to be able to distinguish between playful and serious situations, as in sending audiovisual cues indicating status within the group (Altmann 1967: 365). However, only the capacity for generating metainformation carrying a meaning opposite to parainformation, so far found only in humans, can distance a system both from the immediate adaptive situation and from its own internal thought processes. In this way metainformation can create an awareness of one's responses to external situations, and a possibility of a conscious and deliberate manipulation of these responses, including thoughtful reflection, self-analysis, ironic distance, humour, or self-deceptive denial. The capacity to produce metainformation is also the foundation of self-reflective consciousness, the ability not only to know but also to be aware of the fact of knowing – a mental faculty so far limited, it would seem, to the human species.

Human verbal language alone provides countless instances both of parainformation, used in most social situations requiring co-operation based on clear understanding, and of metainformation, used whenever there is a possibility or need to establish cognitive distance from experienced reality, as evidenced by irony, sarcasm, jokes, hints, allusions, understatements, idiomatic or metaphorical expressions, best exemplified by poetic language. In fact, metalanguage abounds in human colloquial communication, humour being a particularly good case in

point (Deacon 1997: 420; Nesse and Lloyd 1992: 612). A typical joke has a two-layered structure based on surface parainformation and the underlying metainformation: it is usually told in such a way that the narrative provokes in the listener specific parainformation (literal meaning), which is suspended or reversed in the final punch-line by a new and unexpected metameaning. In a good comedy, such as John Sullivan's BBC *Only Fools and Horses*, practically every verbal exchange is capped with an unsuspected metameaning while maintaining the anticipated flow of thematic consistency based on parainformation. In one episode Del Boy's former fiancé, just divorced and eager to rekindle the old flame with Del, asks: "You never married yourself?", to which Del replies: "No, I never fancied myself." The anticipated parainformation would include something realistic such as "No, I was too busy," or "No, I haven't met the right girl," or something equally prosaic, predictable and therefore not funny. On the other hand the implication that Del Boy would have married himself if he had fallen in love with himself is funny because it is surreally improbable and therefore unexpected, while at the same time it follows logically both from the reflexive grammatical structure of the question and from Del Boy's good-natured vanity and self-centredness.

In well delivered jokes the reversal of meaning is postponed climactically until the end of the narrative, so that the humorous effect is achieved by frustrating or surprising the receiver's expectations. That is to say, the receiver usually expects only parainformation (literal meaning), while in a joke the anticipated parainformation is replaced at the end of the narrative by the opposite and therefore unexpected metainformation. Different jokes are funny to different people, depending on the character of the implied metainformation. A person without culturally specific metainformation will not understand a joke, even after understanding the surface meaning, which is why an insider joke will be lost on a person from outside the exclusive circle. At the same time so-called scatological jokes can be understood by most people, because they rely on fairly universal metainformation relating to typical bodily functions. A joke may also be ruined if the teller provides more information than is necessary to lead the listener to the desired metameaning, or when the teller changes the order of provided information and suggests the right metainformation too soon, thus spoiling the climax. (Jokes ruined by "dumb blondes" form another humorous genre.) A well-told joke is first understood only literally (parainformation), but it only makes full sense with the implied metainformation. A successful joke is therefore funny for a person possessing appropriate metainformation, whereas for a person without the right metainformation the joke will be incomprehensible or confusing.

The ability to engage in meta-associations, as exemplified by humour, irony, sarcasm, fantasizing, lying, understatement or double-talk is so much a part of human communication that its absence is often interpreted as a form of mental

impairment or deficiency. One of the symptoms of autism for example is precisely the inability to engage in pretend play, to lie, to joke, and to fantasize. Autistic individuals operate solely on the level of primary representations, that is, of parainformation, taking the world exactly as it comes and using words only with their literal meaning. A joke or a metaphoric use of words are entirely lost on them. There is a reported case of an autistic boy who was told by his mother to “pull the door behind” when leaving the house, and he literally removed the door from its hinges and dragged it behind him (Dunbar 1995: 129; 2005: 51). Autistic people also lack the ability to empathize or speculate about the mental states of other people, the fact that has devastating implications for their ability to manage social relationships. Such people simply do not understand how to handle the subtleties of everyday social diplomacies, which depend so much on understatements, subtexts, tactful evasions of sensitive topics, tension-releasing humour and so on.

While some uses of language such as verbal humour, poetry, literary fiction and so on are deliberately designed to provoke metameaning in receivers, in strictly non-metaphoric uses of language metainformation is normally avoided, or at least is accidental and unintended. Whenever factuality and unambiguous understanding are required, communication is restricted to information provoking specific parainformation, as in scientific reports, instruction manuals, business correspondence, all kinds of directories, traffic regulations and so on. These communicative acts are meant to provide accurate descriptions of facts rather than convey attitudes, convictions, impressions, emotions, or other metaphoric connotations. It can be argued, however, that given the cognitive restlessness of the human brain metameaning is practically unavoidable in all human interactions, so that even communication primarily designed to be denotative and literal, as in traffic signs, can be said to rest on certain implicit, often unconscious cultural assumptions. These may include, for instance, the assumption that the society using traffic signs has a well-developed road infrastructure and is therefore economically advanced, that it cares for the safety of road users and therefore it protects its citizens and so on. However, such implicit meanings, intended or not, are usually accidental in communicative situations designed primarily to engage the receivers’ parainformation, that is, explicit, denotative meaning, although they can provide fruitful field of speculation for social anthropologists and cultural critics.

On the other hand, if factuality is not the primary goal of communication, metainformation can be used lavishly to create intentionally (or sometimes unintentionally) elusive and suggestive meanings, as in visual arts, music, mythical fantasies, poetry and literary fiction. Interestingly in this context, of all art forms music seems to operate entirely on the level of non-discursive and non-referential metainformation, with practically no parainformation involved, unlike literature and most visual arts, which are always referential to some extent, relying on more

or less recognizable representations of physical facts and situations. In some cases a single communicative act can deliberately combine parainformation and metainformation in a mixture of representations of objective facts and of subjective, imaginative evaluations of these facts, as in representational art or commercial advertising. For example, a painted portrait of a real person provokes in the painter and the viewer both parainformation, relating to the identity and appearance of the sitter, and metainformation, provoked by the artistic convention, style and technique, which convey the painter's personal attitude to the sitter as well as his interpretation of the sitter's appearance and personality. By comparison a casual photograph, due to the more accurate, indexical nature of the photographic process, conveys first of all parainformation, involving very limited intentional metainformation. For instance, video footage recorded on CCTV security cameras is purely automatic and contains hardly any (intended) metainformational content. Only in artistic photography, where the photographer deliberately interferes with the technical process (by selecting the object and the lens, composing the frame, manipulating colour, lighting conditions and so on), can we talk of the dominance of metainformation over parainformation, in other words, of interpreting over informing. Visual commercial advertising too is a good example of mixing para- and meta-levels of meaning to ensure communicative effectiveness. In a typical advertisement a commercial product, pictured realistically to aid instant and unequivocal recognition, is provided with a brief verbal description (parainformation), again for clear identification, while metainformation is conveyed through various accompanying images and jingles stirring different, usually unexpected associations, often unrelated to the advertised product in any direct way. In some commercials those meta-associations tend to dominate almost entirely, with the advertised product occupying little space and providing no metainformation on its own. A success of visual commercials relies therefore on a careful balance between realistic representation of the advertised product and the attached, often surprising and unexpected meta-associations, whose character depends on the anticipated or provoked interests and expectations of the public.

The involvement of metainformation places advertising halfway between parainformational, denotative communication, such as that provided by business information in the Internet or *The Yellow Pages* for example, and metainformational, connotative communication typical for visual arts, whose primary aim is not so much to inform the viewers about the physical facts of the world as to stimulate varied and often elusive cognitive and emotive associations relating to one's perception and impressions of the physical reality. The presence and range of metainformation can thus serve as a gauge of artisticity, whereby explicit, literal representations, as in casual snapshot photography or photographic forensic documentation, would be considered non-artistic, while implicit, suggestive

representations, as in stylized photography or in painting, would be more typical for art. Thus scenes of explicit, graphic sex and violence in film can be perceived as less aesthetically satisfying than representations that only mark or suggest the acts in question, leaving more to the imagination, that is, to the viewers' meta-associations. For receivers prepared to engage their meta-associations explicit representations, as in pornography for example, can be banal and offensive to their intelligence and good taste, while implicit, suggestive representations, as in well painted nude figures or in subtle erotic poetry, precisely due to their understatement, can provide an aesthetic, emotional, and intellectual challenge and satisfaction. Visual artefacts relying mostly on predictable parainformation as well as on limited and equally predictable metainformation include action films, comic books, cartoons, computer games, political placards, and graffiti, whereas artefacts so designed as to engage the receivers' wide-ranging and less predictable aesthetic, emotional, and intellectual meta-associations are those that, for that very reason, find their way into art history and are on display in galleries and museums.

The distinction between parainformation and metainformation thus corresponds to the division into primarily factual communication and primarily imaginative, or fictional communication, respectively. In this way the two associative levels underlie the difference between, for example, pornography and erotic art, between cooking recipes and food advertisements, between a curriculum vitae and a *Bildungsroman*, between a historical account and an ethnic myth, and finally between science and religion, with philosophy somewhere in between. At the same time it must be said that the division into parainformational and metainformational forms of communication is never clear-cut, because in most cases a particular communicative act, whether primarily factual or primarily fictional, will always engage both associative levels in varying degrees, with sufficient overlap to justify never-ending philosophic and critical debates about the relations between science and religion, between history and mythology, between objectivity and subjectivity, between fact and fiction. Religion for example, primarily a metainformational phenomenon, often contains some parainformational references to empirical reality, as evidenced by some ethno-historical elements of the Judeo-Christian Bible, corroborated independently by historians and archaeologists. Likewise science, primarily a parainformational phenomenon, involves formulating abstract models and theories, that is, engaging in metainformational cognitive processes, often detached from direct observation, empirical testing and experimentation. However, while religions survive on faith alone and do not require any empirical proofs to validate their dogmas, in science metainformational, theoretical speculation is constantly being verified against available evidence, and theoretical models that are not borne out by facts are rejected as unscientific. When an unscientific theory is self-deceptively accepted as scientific it becomes pseudo-science, as was

the case with T. D. Lysenko's crackpot biological theory, which for political reasons dominated Soviet science from the late 1920s to mid-1960s (Birstein 2001: 45–51). Similarly self-deceptive, ideologically motivated wilful distortions and misrepresentations of scientific concepts can be found in the writings of contemporary postmodern philosophers such as Derrida, Lacan, Deleuze, or Guattari (Sokal and Bricmont 1998).

More useful definitions

The purpose of this chapter has been to transform the premise about interaction between systems, understood as an exchange of information (and energy), to arrive deductively at a number of possible communicative situations likely to occur between interacting systems in the empirical world. Once these situations have been identified, described and defined, they were given linguistic labels, including contiguous, indexical, iconic, and symbolic types of communication. The rest of the book will discuss the possible origin and evolution of these types of communication in the animal and human worlds. Let me first sum up the content of the systems model of communication developed so far by introducing the following additional definitions:

- Information exchanged during interaction between closed, that is, non-autonomous systems (as in the example with a meteor crashing onto the earth) will be referred to as an exchange of *physical states*. Physical states can be exchanged only during contiguous communication;
- Information exchanged during interaction between open, that is, autonomous systems capable of using parainformation alone (as in plants and non-human animals) can be of two kinds, depending on the involvement of *intentionality*. Intentionality presupposes active behaviour of the sender, rather than passive behaviour of the receiver. Also, intentionality can be either motivated genetically, as in plants or animals, or both genetically and volitionally, as in humans. Thus
 - unintentional information exchanged between autonomous systems will be referred to as a *cue*, and
 - intentional information exchanged between autonomous systems will be referred to as a *signal*.Cues and signals can be exchanged only during contiguous and indexical communication;
- Information exchanged during interaction between autonomous systems capable of using both parainformation and metainformation (as in humans) can

be of three kinds, depending on the involvement of intentionality and level of meaning. Thus

- unintentional information exchanged between autonomous systems on the level of parainformation will again be referred to as a *cue*;
- intentional information exchanged between autonomous systems on the level of parainformation will likewise be referred to as a *signal*; and
- information, both unintentional and intentional, exchanged between autonomous systems on the level of both para- and metainformation will be referred to as a *sign* (at last!). Signs can be exchanged during contiguous, indexical, iconic, and symbolic communication;
- Intentional, meaningful sign (that is, a sign produced by sender with para- and metainformation attached to it) will be referred to as *message*. In other words, a sign refers to perceived information, while message refers both to sign and its meaning.

Let me compare the above systems definition of a sign with Peirce's definition quoted at the beginning of this chapter. It would appear that Peirce reserves the use of signs to humans alone, since he speaks of "somebody" and "the mind of a person" – a restriction that would coincide with my stipulation that signs relate to communication between systems capable of generating metainformation; in practice, between humans rather than lower animals or machines. Peirce then introduces a concept of the "interpretant" of a sign, which in itself is another kind of sign ("an equivalent sign," "a more developed sign"): this "sign" would appear to correspond either with parainformation or metainformation in the systems model. It is difficult to see, however, whether Peirce refers to "interpretant" as a denotative or connotative meaning. Peirce also speaks of an "object" represented by the signs, although he does not specify whether he means an external, empirical object denoted by the sign, or an idea of that object in a person's mind, which is of course a different thing. Admittedly, Peirce does evoke the concept of "idea" in the Platonic sense, although he seems vague about the relations between this "idea" and the "object." Nor is it clear from his definition whether the "object" has objective existence outside the mind or is created by the mind. Winfried Nöth helps to clarify the problem by arguing that Peirce's "object" corresponds to the referent in other models of the sign: it is what the sign "represents," usually something else but in the borderline case of self-reference Peirce's *representamen* (sign) and object can also be the same entity (Nöth 1995: 43).

Peirce also distinguishes between two kinds of objects: the *immediate* and the *mediate* or *dynamical* object. The immediate object is the "Object within the Sign," the object "as the Sign itself represents it, and whose Being is thus dependent upon the Representation of it in the Sign." It is thus a mental representation of an object,

whether this object actually “exists” or not. In systems terms Peirce’s immediate object probably corresponds with parainformation as the sign’s direct, literal meaning. On the other hand the mediate, real, or dynamical object is the “Object outside of the Sign,” it is “the Reality which by some means contrives to determine the Sign to its Representation,” or that “which, from the nature of things, the Sign *cannot* express, which it can only *indicate* and leave the interpreter to find out by *collateral* experience” (Peirce 1998: 136; Nöth 1995: 43), which may correspond with the usually vaguer and more “remote” metainformation as the meaning not immediately indicated by the form of the sign nor by its denotative meaning. These broad analogies between Peirce’s semiotic formulations and the systems model notwithstanding, my main methodological objection, as expressed at the beginning of this chapter, refers to the method behind Peirce’s definitions: the reader simply does not see by what steps of argument the philosopher arrived at his definitions, and in the absence of intermediary reasoning the final definitions have to be accepted on faith rather than on the basis of logic or evidence.

It would also appear that the systems model of communication presented here has independently validated Peirce’s semiotic triad of icon-index-symbol, with a correction, however, of putting index before icon if the sequence is to reflect the evolutionary development of types of communication from cognitively simple to more advanced. It was also necessary to add contiguous communication as an important and ubiquitous form of communication in all empirical systems, and as a prerequisite of all other types of communication.

In the light of the systems definitions introduced above particles and mineral objects colliding in the universe will be said to exchange physical states rather than cues, signals, or signs. Plants will also be said to exchange physical states with the environment (when absorbing carbon dioxide and releasing oxygen into the atmosphere), but they can also passively reveal cues (for example, in their green colour – an accidental colour of chlorophyll, a substance involved in photosynthesis), and send active signals (for example, in developing brightly coloured flowers to attract pollinating insects or birds). Animals can also use the same types of information (physical states, cues, and signals) in their interactions with the environment. For instance, they exchange physical states in absorbing oxygen and releasing carbon dioxide; they passively reveal phenotypic cues such as body size or weaponry (antlers, canine teeth and so on); and they actively send signals in the form of warning calls, aggressive grunts, baring of teeth, bristling up and so on. Marc D. Hauser makes a similar distinction between cues and signals in animal communication: for him cues, like signals, represent potential sources of information about an animal’s behaviour and intentions, but unlike signals cues tend to be permanently ON, whereas signals are more plastic and can be in an ON and OFF state. As a result, signals but not cues are produced in response to socio-ecologically

relevant and temporally varying changes in the environment. Cues also typically correspond to an individual's or species' phenotype, and their expression carries no immediate extra cost, whereas emission of signals does involve physiological costs (Hauser 1998: 9).

Finally, human interactions with the world involve the full suite of distinguished types of information, involving physical states, cues, and signals similarly to other animals, as well as intentional, culturally generated signs: indexes, icons, and symbols. Thus physical states will involve physiological and metabolic processes occurring within the human organism; cues will refer to such phenotypic traits as manifest bodily anatomy, including sexual dimorphism, skin colour and other racial characteristics; signals will include physiological reactions such as perspiration, blushing, yawning, coughing, sighing, crying and so on, as well as involuntary gestures and bodily postures; while signs will include articulated speech, symbolic gestures (as in sign language), bodily adornments and other visual signs (as in art). When interacting with the mineral or vegetable world (during a walk in the countryside for example) humans will be said to exchange physical states with their environment; when interacting with animals humans will exchange both physical states and cues as well as signals; whereas when interacting with other people humans will exchange both physical states, cues, signals, and signs.

According to the adopted definition, communication based on signs presupposes a system capable of producing and receiving metainformation – the capacity so far reserved only to humans. Sometimes, however, some reactions produced by non-human systems can be interpreted as “signs” by persons who regard certain natural phenomena, such as the strike of a thunderbolt, a flood, an earthquake, or a pestilence as resulting not just from physical causes but from the actions of some purposeful, supernatural intelligence, variously identified as “god,” “providence,” or “fate.” Interpreted in this light natural phenomena begin to assume human-like characteristics, as when the prophet Elijah's prayer for rain is answered with “Behold, there ariseth a little cloud out of the sea, like a man's hand” (*1 Kings* 18:44). Because having a purposeful design about things presupposes an autonomous system equipped with metainformational cognitive faculties, for religious persons the entire universe, created by such a superior being, can indeed be filled with “signs” rather than simply with physical states.

CHAPTER 3

Needs as motivators of behaviour

Of all the distinguished types of communication the contiguous one, involving direct interactions with the immediate environment, is the most ubiquitous in the empirical world, including of course human behaviour. In fact, contiguous communication is so common and seems so obvious that communication studies and semiotics rarely acknowledge its importance, concentrating mainly on symbolic, especially linguistic communication. However, seen from the evolutionary perspective symbolic communication, notwithstanding its importance as the defining marker of humanity, constitutes only a fraction of human communicative behaviour, and is of necessity founded upon phylogenetically older and still active forms of communication, involving contiguous interactions with the environment as well as indexicality and iconicity. This is why in the holistic view of the evolution of communication systems presented in this book the discussion of symbolic communication has to be deferred to Chapters 10 and 11.

For all non-human autonomous systems, that is, for plants and animals, contiguity is practically the only possible form of interaction with the environment, both within and across the species, and even across the kingdoms, where organisms are often engaged in co-operative, mutualistic communication, as is the case with animals that pollinate flowers or disperse their fruits. In certain plants flower design and coloration are often well matched to the visual physiology of particular pollinating insects or birds. For example, flowers pollinated by hummingbird are often red, a colour attractive to those birds, while blue and yellow are more common in flowers pollinated by bees (Marler 1977: 47).

Among humans contiguous interactions with the environment are of necessity also always present as a physical precondition of more complex forms of communication involving indexes, icons, and symbolic signs. After all, a signal or a sign must first of all be contiguous, that is, spatio-temporally co-present with the receiver to be perceived, interpreted, and responded to by appropriate behaviour. A particular sign (a received letter for example) understood as image can be spatio-temporally displaced from the original (the same letter at the moment of being posted by sender), and its content may provoke in the sender's and receiver's minds all kinds of para- and meta-associations, referring to things and events likewise spatio-temporally removed from the sender's and receiver's current whereabouts. However, the letter will not perform its symbolic communicative function without

first being contiguously, physically co-present with the receiver. Obvious and banal as it may seem, it is important to remember that no communication: indexical, iconic, or symbolic, can occur without sender and receiver first interacting using direct, contiguous stimuli.

Contiguous communication is also what homeostatic self-regulation in autonomous systems is about. For instance, plants react adaptively to light, humidity, and temperature, and animal creatures too are more than passive puppets of their environment. They constantly weigh inputs from different senses and their own internal states, and on average are able to avail of optimal behavioural strategies to aid their survival and propagation. In the animal as well as the human world young organisms enter the world not with minds as blank slates, still to be inscribed by experience, but with genetically programmed predispositions to respond in particular ways to objects and events they encounter in their lives (Hauser 1998: 522). Empirical systems practically always exist in a competitive environment, where survival and a chance to reproduce depend both on quick and correct assessments of current situations and on equally quick and correct reactions to these situations (encounters with predators, search for food and mating opportunities *etc.*). This would mean that living systems equipped from birth with ready-made, automatic responses to certain vital experiences should stand a better chance of survival than systems not equipped with such inborn responses, which still have to learn how to react appropriately to important stimuli as they appear. The latter possibility is in fact highly unviable in the natural world, because systems that have to learn the correct responses to critical situations the hard way, by trial and error, are simply quickly eliminated by natural selection the first time they make a vital mistake. This means that the vast majority of responses to environmental stimuli must be based on genetically inherited predispositions, with ontogenetic learning playing only a comparatively small role in the system's self-regulation, being in fact limited mostly to systems equipped with more advanced and flexible cognitive faculties such as those found in humans (Hauser 1998: 3; Cartwright 2000: 40, 344; Badcock 2000: 9–11; Tooby and Cosmides 1992a: 61; Symons 1992: 140).

Needs and emotions

As observed in Chapter 1, functional equilibrium and homeostasis perform their regulatory role using the principle of negative feedback (Bertalanffy 1973: 42, 45). As Richard Dawkins also explains, living organisms are equipped with a measuring device which gauges the discrepancy between the current state of things, and the “desired” state. The device is built in such a way that the larger this discrepancy is, the harder the organism works to reduce the gap between the existing and the

desired state (Dawkins 2006b: 50). In this sense the organisms' contiguous interactions with the environment involve both the external inputs that disturb the organisms' functional equilibrium, and the organisms' own adaptive responses designed to reduce that disturbance. To account for this adaptive significance of contiguous communication let me introduce a definition, whereby a disturbance of the system's functional equilibrium caused either by a deficiency or excess of certain type of information or energy will be called a *need* (Wierciński 1981: 34).

Examples of needs thus understood are of course legion, and their character depends both on the generic nature of the system and on the specific environmental niche it occupies. With millions of vegetable and animal species existing in the world on the one hand, and with an equally large number of possible environmental niches occupied by each organism on the other hand, a possible number of needs experienced by each creature can indeed be beyond calculation or description. However, from a functional point of view what all cases of interactions between living systems and the environment have in common is the underlying principle of self-regulation, which causes the system to reduce deviations from its functional equilibrium whenever it is disturbed by a particular environmental input. Thus, for instance, in warm-blooded creatures overheating of the body due to hot weather or exercise (excess of energy) will cause the need to cool down, followed by appropriate involuntary reactions such as perspiration, instinctive search for shade or water, in humans also accompanied by such conscious actions as putting on lighter clothes, taking a cold bath, switching on air conditioning, having a cold drink and so on. Feeling cold in low temperature is in turn an example of energy deficiency, which causes the need to get warm to maintain the desired thermal balance, achieved by huddling up to reduce the loss of surface heat, finding a warm shelter, putting on warm clothes, eating high-calory food and so on.

Examples of needs caused by excess of information include (in humans) loud noise, intensive social interaction, dazzling light, mental stress – indeed, any stimulus considered excessive (“too much”) and therefore intolerable by the system, and causing the need to remove the noxious stimulus: turning the loud music down (or putting in ear plugs), seeking solitude, wearing sun glasses, going to sleep or finding some other restful or relaxing activity – in a word, doing whatever is appropriate to lower the excessive diversity and level of informational inputs in order to restore functional equilibrium. On the other hand deficiency of information can include forced silence, loneliness or boring company, visual monotony (during a sea journey for example), denied access to education – in short, any lack or shortage of desired information, likewise considered intolerable and unacceptable by the system, and causing the need to increase or change the information intake: seeking company and congenial surroundings, going on an exciting holiday trip, enrolling in a college course or buying a book – in a word, doing whatever

is appropriate to increase the diversity and level of informational inputs in order to restore the disturbed functional equilibrium.

Once a system's functional equilibrium is disturbed by an excess or deficiency of the required form of information or energy, what prompts the system to restore this equilibrium is an internal reaction which we will call with a familiar term *emotion*. Derek Bickerton understands emotions in a similar way as "bridges between representation and response" (Bickerton 1990: 89). More specifically, in the context of the systems' interactions with the environment it is possible to talk about two main kinds of emotions: 1/ *negative emotions*, caused by a disturbance of the system's functional equilibrium; and 2/ *positive emotions*, caused in the system by a restoration of functional equilibrium. In both cases emotion is an internal, genetically programmed reaction of the system which participates in homeostatic self-regulation, by causing the system to avoid or reject noxious or dangerous stimuli through negative emotions, and to seek agreeable stimuli through positive emotions. This is tantamount to saying that emotions perform an adaptive function, or, in the words of Steven Pinker, they are "well-engineered software modules that work in harmony with the intellect and are indispensable to the functioning of the whole mind" (Pinker: 1998: 370). Also according to Henry Plotkin the specific emotions arising from particular life situations "must ultimately derive from the fundamental adaptive dichotomy of what ensures survival and perpetuation of genes and what does not" (Plotkin 1994: 208).

Lest the basic division of emotions into negative and positive appear too general and obvious (it is), the psychologist Paul Ekman, working on evolutionary principles, has established a larger but still small number of seven basic emotions as displayed universally by the human face. They include, on the negative side, *sadness, anger, fear, disgust, contempt*, and *surprise*, and on the positive side *happiness* as the general emotion of relief, satisfaction, and successful adaptation (Ekman and Friesen 1975; Ekman 2003: 58; Russell and Fernández-Dols 1997: 10–13; Brown 1991: 134). The cognitive archaeologist Steven Mithen argues that these emotions must have existed among all of our ancestors back to at least six million years ago, because they are also possessed by the modern great apes (Mithen 2005: 86). As also argued by the literary scholar Joseph Carroll, the seven universal emotions distinguished by Ekman are essential components in the tonal and generic structures of literary texts, with sadness underlying the elegiac genre and tragedy, happiness – comedy, surprise – suspense, and anger, contempt, and disgust dominating in satire (Carroll 2004: 114). Emotions are primarily caused by informational stimuli, but due to the holistic nature of informational and dynamic processes in autonomous systems they also have their characteristic "energetic," or physiological manifestations, as expressed in intuitive linguistic expressions such as "to get hot under the collar" when agitated or nervous, "to get cold feet" when

indifferent or uninterested, “to freeze with fear,” “to meet with cold/lukewarm/warm reception,” “to have the hots” for someone, to experience “fire of passion” and so on. The metaphoric, or synaesthetic language used to express the rich and subtle but elusive nature of human emotional experience results no doubt from the presence of somatic sensations involved in emotions, which do not lend themselves easily to precise verbal expression. This is also why most of the time people communicate their emotional states through non-verbal signals and symptoms, which tend to be more instinctive and involuntary, without the conscious intentionality that underlies verbal communication. These signals include certain uncontrollable bodily states such as breathlessness, perspiration, blushing, shaking, twitches and other manifestations of the autonomic nervous system which controls and receives sensations from the heart, lungs, guts and the genital organs. Other important components of non-verbal communication consist of posture, hand gesturing, emotive vocalizations and facial expressions, which require special training to be controlled voluntarily and are very difficult to fake. Only actors and confidence tricksters are adept at controlling these non-verbal signals of emotional states, while for most people non-verbal communication is largely beyond voluntary control (Plotkin 1994: 209).

As said earlier, particular instances of excess or deficiency of the required kinds and levels of information or energy in empirical systems are limitless, but it is possible to arrive deductively at a limited and possibly exhaustive number of the types of needs likely to be found in real life. This can be achieved first of all by dividing the needs into those involving primarily excess or deficiency of energy, and those involving primarily excess or deficiency of information. I say “primarily” because, as stated earlier, informational (cognitive) and energetic (physiological) processes in autonomous systems are always inseparably involved in the systems’ interactions with the environment. Energetic processes include first of all bodily metabolism as well as involuntary physiological reactions such as perspiration, changes in body temperature, sexual arousal and so on. On the other hand cognitive processes involve the computational operations of the brain, supremely realized in the conscious (voluntary) mental activities of the human mind. Consequently, the needs involving most energy and least information will be called *energetic*, while the needs involving least energy and most information will be called *cognitive*, with the more specific types of needs distributed within the continuous spectrum in between.

Incidentally, the above general division of needs into energetic and cognitive can be viewed as a systems version of the traditional philosophic dichotomy of “body” versus “mind” (or “soul”), “matter” versus “spirit,” or the Dionysian versus the Apollonian elements in human behaviour. However, while the theological and philosophic debates have tended to separate and juxtapose the two aspects of

human existence, a holistic approach should emphasize the interconnectedness and inseparateness between the energetic and cognitive processes in autonomous systems, as indeed has often been recognized intuitively by artists and intellectuals. Oscar Wilde for example observed that “those who see any difference between body and soul have neither,” for “there is animalism in the soul, and the body has its moments of spirituality” (Wilde 1994: 48). Contemporary psychologists too widely accept the complex, functionally inseparable unity of the brain and the rest of the body, quite against the ancient dualism of “material” versus “spiritual” endemic in Western philosophy. In the words of the psychologist Richard Webster, “the human organism is an indivisible unity. Both consciousness and intelligence are properties, ultimately, not of the brain or of any organ or set of organs, but of both acting together” (Webster 1995: 485). This is also why evolutionary psychology, as represented by John Tooby for example, advocates an integrated scientific monism in the place of the outdated dualism of body/mind, physical/mental, natural/human, biological/social and so on (Tooby and Cosmides 1992a: 21, 49).

Types of needs

Taking into account both the interrelatedness between the energetic and cognitive processes in autonomous systems, and the requirement of the homeostatic equilibrium in the systems’ relations with the environment, let us try and identify the types of needs likely to be found in empirical systems, beginning with the most energetic ones.

All living systems are subject both to physical and biological laws that of necessity limit the systems’ lifespan, causing them to age and ultimately to die, even if they do not die prematurely due to predation, disease, starvation, or fatal accidents. Because all systems do their utmost to remain alive, from a homeostatic point of view termination of existence creates an obvious, final, and irreversible disturbance in the system’s functional equilibrium. Since no individual organism can live forever, the only way to ensure some form of indefinite continuity of existence (barring perennial human dreams of eternal youth and immortality) is to produce its own copy. As we know, this is accomplished by a process of biological reproduction, which in the majority of species is sexual in character, involving the mixing and recombination of genetic material from two parents, male and female, to create if not an exact copy then at least a genetically closely related organism. The need to reproduce will be called *procreative*, and given its crucial importance in the generic survival of empirical systems it may be considered the most energetic of needs, controlled by strong instincts and emotions, and least subject to voluntary control. The cognitive component of the procreative need will in turn involve

the ability to interpret correctly relevant signals of sexual display in prospective mating partners as indexes of their genetic fitness.

During their available lifetime systems also require regular intakes of environmental energies to sustain their metabolism. This is normally accomplished by consumption of organic substances that are chemically processed by the system to release the energy contained therein. The need related to the intake of life-supporting energies will be called *nutritional*, and again given its importance for the system's individual existence it too may be considered primarily an energetic need, governed by involuntary instincts and emotions. On the other hand the cognitive component of the nutritional need will include the ability to search for and recognize edible objects in the environment. The related physiological needs partaking in metabolic processes include breathing, which provides oxygen to the tissues and removes carbon dioxide, and sleeping, which restores the normal levels of activity of the central nervous system by helping to produce proteins essential for maintaining the functioning of cells, including neurons (Greenfield 2001: 146; Guyton & Hall 1996: 763).

Autonomous systems must also be able to avoid or counteract physical interactions with the environment that are potentially harmful to their bodily integrity and consequently to their fitness. Given the fact that all natural systems live in a highly competitive environment, with constant struggle for limited but vital commodities such as nutritional resources and reproductive opportunities, they must guard themselves against harmful physical interactions with competitors, which can reduce their chances to reproduce due to premature death or injury. The related need will be called *protective*, and will also depend to a large extent on built-in emotions (fear, aggression), instinctive defensive reflexes, as well as cognitive skills related to danger assessment and fighting strategies. In all human societies the protective need appears early in childhood in the form of spontaneous aggressive behaviour and rough-and-tumble play, in later life to manifest itself in equally universal fascination (in both sexes) with violence, as evidenced by the popularity of blood-and-thunder tragedies, murder mysteries, spy thrillers, adventure stories, action movies, and media crime reports. Many people enjoy participating in, and most people enjoy watching, the stylized, bloodless combat we call sport, or what George Orwell called "war without guns," which basically consists of contests of aiming, chasing, or fighting, complete with victors and the defeated.

An individual system can also maximize its existence by interacting with other members of the group and exchanging with them the needed resources and adaptively relevant information. Thus understood co-operation characterizes most autonomous systems living in groups and populations, despite the fact that biologically speaking all organisms are selfish in promoting first of all their own genes rather than disinterestedly helping others (Dawkins 2006a: 32–36). At the

same time another fact of nature is that organisms co-operate under certain conditions, because co-operation generates benefits for selfish individuals. All sexually reproducing species form co-operative alliances of varying durations, the smallest of which is the parental pair responsible for begetting, in more advanced species also feeding, protecting, and raising the offspring. Also, since co-operating over access to resources and over their distribution within the group increases statistically the chances of survival of a single system, co-operation appears to have adaptive significance, and as such is governed by genetically motivated responses towards other group members (Cartwright 2000: 301). For instance, a pack of hyenas can catch prey so much larger than a lone hyena can bring down, so it pays each individual to hunt in a pack, even though this involves sharing food. Emperor penguins conserve heat by huddling together, so that each one gains by presenting a smaller surface area to the elements than he would on his own. A fish that swims obliquely behind another fish may gain a hydrodynamic advantage from the turbulence produced by the fish in front, a phenomenon that may also account for the V-formation of flying birds (Dawkins 2006: 166). A group of human hunters can capture much larger animals than any individual acting alone can manage, and they can see off danger which would be a real threat to a solitary individual. Humans have developed psychological mechanisms designed to deliver benefits even to nonrelatives, provided that the delivery of such benefits acts, with sufficient probability, to cause reciprocal benefits to be delivered in return. In deferred implicit exchange one party helps another at one point in time, in order to increase the probability that the act will be reciprocated at some unspecified time in the future. Natural selection can thus favour co-operation not for the good of the group but because it benefits each individual (Tooby and Cosmides 1992a: 169; Sterelny 2006: 217).

Consequently, the need related to the co-operative behaviour among living systems will be called *social*, involving both emotions that control social bonding, primarily among genetically related organisms, and cognitive skills such as theory of mind, intuitive psychology, and what Steven Pinker calls intuitive economics, based on the concept of reciprocal exchange, which we use to swap goods and favours to benefit both parties involved in the transaction (Pinker 2002: 221). In addition to instinctive co-operative behaviour, in humans the social need also includes culturally acquired information cementing the group's identity and aiding its survival in competition with other groups: elements of culture such as ethnic language and history, folklore and religion, social hierarchy, laws, customs and so on.

In addition to exchanging and sharing vital energies and information with other members of the group, individual systems must also actively search for the necessary resources in the environment. Even systems as relatively immobile as plants, which are literally rooted to the ground, turn their leaves towards the sun

to maximize life-supporting photosynthesis, while animals, with their proverbial mobility, complex motor skills and sensory apparatus, constantly penetrate the environment searching for food and potential mates. Due to the fact that most resources needed for survival are either hidden or scattered thinly in the environment and have to be found, for most animal, that is, for non-photosynthesizing species, active, mobile behaviour has clear evolutionary advantage over passivity and inaction (the latter behaviour is in fact limited to a small group of predatory insects such as spiders, which patiently and passively wait for their prey to get caught in the web).

The still largely instinctive exploration of the environment by animals is supplemented in humans by a more conscious and systematic study of the world in search of the needed resources. In his study of human environmental preferences the psychologist Stephen Kaplan distinguishes the category of “mystery,” defined as the promise of more information if one ventures deeper into the landscape. Mystery is based on the inference that one could learn more about the scene if one could explore its third dimension by changing one’s vantage point. A sense of mystery is enhanced by such characteristics as screening in the foreground, a winding path, a distant prospect or other features that suggest the presence of more information while at the same time partially obscuring it, such as a brightly lit area partially obscured by light foliage, or visually impenetrable foliage with a hint of a gap where one could pass through. Even slight undulations of the terrain can contribute substantially to mystery (Kaplan 1992: 588, 594).

A historically more recent spectacular example of human exploratory behaviour is science, understood as a socially organized endeavour aimed at collecting, storing, and utilizing knowledge about the world, acquired through empirical observation, laboratory testing, experimentation, and abstract theorizing. The technical and intellectual scale of scientific inquiry is of course far superior to animal instinctive exploratory behaviour, but the underlying adaptive purpose – the search for life-supporting resources – appears in both cases similar (Shepard 1997). The related need will consequently be called *exploratory*, and will primarily involve cognitive skills related to the gathering and processing of relevant environmental information, sustained by curiosity and exploratory drive as the motivating emotions.

The exploratory activity naturally leads to the discovery both of different elements of the environment and of functional relations linking these elements. Assuming that the natural environment represents an intelligibly ordered system based on predictable physical and biological laws rather than incomprehensible chaos, its exploration leads eventually to the discovery of some of the existing regularities, patterns and laws. Exploration thus involves the recognition, identification, and classification of the adaptively relevant spatio-temporal elements of

the environment, including different types of terrain (forest, desert, mountains, glaciers, water reservoirs *etc.*), and the various temporal features (alternation between day and night, the lunar and solar cycles, the successions of the seasons, biological rhythms such as female menstruation and pregnancy, succession of generations, and individual lifespans).

Depending on its adaptive value a particular spatio-temporal element of the environment will provoke either positive or negative emotions together with corresponding reactions. Thus environmental features aiding survival, such as lush vegetation promising abundant food, sources of fresh water, warm climate or season providing thermal comfort, terrain combining groves for shade and shelter with meadows and undulations that offer optimal safety from predators (the ability to see without being seen), day-time with increased visibility to spot approaching danger, clear sky with patches of clouds promising refreshing, passing showers and so on, will be adaptively associated with positive emotions inducing relaxation, confidence, and curiosity, as well as feelings of safety, comfort, and optimism. On the other hand environmental features hindering survival, such as barren deserts and impenetrable rocky mountains, excessively hot or cold climates and seasons, vast open spaces increasing exposure to predators, thick forests, jungles and darkness limiting visibility and likewise increasing vulnerability to lurking predators, atmospherising phenomena such as droughts or incessant rains, hail storms, snow blizzards, as well as occasional elemental crises and disasters such as electric storms, earthquakes, floods, avalanches, landslides and so on, will all be adaptively linked with negative emotions inducing anxiety, fear, panic, withdrawal, discomfort, insecurity, hopelessness, helplessness, and pessimism. (The above-described emotional responses to specific elements of the environment are of course biased towards typical human needs and lifestyles, as there obviously exist numerous living species well adapted to environmental conditions considered extreme, uncongenial or hostile to habitation from a human point of view.)

Various specific elements and features of the natural environment will also be classified according to the emotional response they provoke, depending on their adaptive significance. Thus dangerous, poisonous, and noxious species such as large cats, snakes, and insects, respectively, are universally fear-provoking and repugnant to humans, while harmless species, especially when used as food (most hooved mammals, some birds and fish), will spontaneously provoke correspondingly positive or neutral emotions (Brown 1991: 115). Also, during the exploration of the environment in search of optimal habitat different sensory stimuli relating to manifold environmental features such as shape, size, texture, colour, sound, smell and so on will be mentally classified into various patterns and configurations, depending on the underlying emotional response as dictated by adaptive significance. These emotive, often elusive sensations related to our perception of

nature are known to everyone, including of course poets, painters, and musicians, whose individual talents enable them not only to feel but also to express their emotive response to the world around them in tangible works of art. Ralph Waldo Emerson's rapturous appreciation of natural beauty, combined with his intellectual reflection on its possible causes, well captures the instinctive emotive response we all feel towards the various elements of the natural environment:

Such is the constitution of all things, or such the plastic power of the human eye, that the primary forms, as the sky, the mountain, the tree, the animal, give us a delight *in and for themselves*; a pleasure arising from outline, color, motion, and grouping.... besides this general grace diffused over nature, almost all the individual forms are agreeable to the eye, as is proved by our endless imitations of some of them, as the acorn, the grape, the pine-cone, the wheat-ear, the egg, the wings and forms of most birds, the lion's claw, the serpent, the butterfly, sea-shells, flames, clouds, buds, leaves, and the forms of many trees, as the palm (Emerson 1994: 1506).

The psychologist Ellen Dissanayake likewise argues that the human tendency to seek order in the outside world, originally an adaptive behaviour in our ancestral environment, can now exist for its own sake, giving delight and satisfaction in and of itself. In artists giving shape and form to the amorphous and erratic sensations constitutes an intensification of this general innate structuring proclivity (Dissanayake 1991: 114).

From an adaptive point of view positive emotional responses are evoked by human perceptions of such specific environmental features as small (that is, unthreatening) size, soft textures (not causing cuts or bruises during handling), green, blue, and yellow colours (of vegetation, clear sky, and warm sun, respectively), sweet taste (of high-calory sugar and high-protein meat), sounds of medium frequency and volume (relative to human voice). A young, proportionately built, healthy human body of both sexes, with a smooth, unblemished skin, possessing all the visual cues of fertility/virility will also evoke highly positive emotions, including sexual attraction in the (usually) opposite sex (Etcoff 1999). On the other hand negative emotional responses will be caused by very small or very large objects (difficult to handle and control), hard and sharp surfaces and textures (easy to cause cuts and injuries when in contact with the body), very dark and very bright colours (reducing visual differentiation of details), bitter and sour taste (often associated with poisonous substances), smell of putrefaction (an index of infectious decay and decomposition) and so on. Negative emotional response (repugnance, indifference, fear) will also be associated with an ageing, wrinkled, stooped, disfigured, or sick human body (either past its fertility or infertile). The cognitive need related to the emotive assessment of the different elements and

features of the environment will accordingly be called *aesthetic* (for want of a better word). For John D. Barrow too human appreciation of the “beauty” of the natural environment, of a young, well-proportioned, healthy human body, and of works of art has its basis in latent instincts and intuitive responses to the environment, imprinted in the mind through natural selection during human evolutionary history (Barrow 1995).

Given human metainformational cognitive faculties, it is possible to argue that the sustained exploration and functional assessment of the environment will lead to a more conscious reflection about the world, extending beyond the immediate, contiguous adaptation and satisfaction of the basic energetic needs. In humans the contiguous interpretation of the relevant environmental stimuli can thus be complemented by metainformational speculation and inquiry into the laws underlying the discovered regularities, leading to the formulation of general models of the world, including hypothetical explanations of the ultimate causes and goals of the observable natural and socio-cultural phenomena. Such abstract speculation would also presuppose a conscious perception of time and working memory extending beyond the immediate present moment to embrace imaginatively both the past and the future – a mental faculty most probably available only to humans. Able to perceive the flow of time and to engage in metathinking the human mind appears cognitively equipped to ask questions and formulate theories regarding the origin, purpose, and meaning of everything that surrounds humans in their daily interactions with the natural and social environments.

Despite the fact that metathinking often distances humans from their direct experience of the world, and that it is not always conducive to the satisfaction of the energetic, adaptively more vital needs, it would appear that abstract speculation about the nature of the world and a search for its possible meaning have proved advantageous to humans from the point of view of long-term adaptation. A system not tied deterministically to an environmental niche assigned to it by evolution, as is the case with most animals, but flexible enough in its responses to be able to adapt to different conditions and to expand throughout the globe and even into cosmos, as is the case with humans, requires advanced cognitive faculties based on metathinking and the expanded perception of time to accomplish this. Consequently, the cognitive need related to the search for the general purpose and meaning of life and of the world will be called *teleological* (from Greek *telos*, “goal”). As far as we know the teleological need is present only in humans, and it is satisfied by means of metacognitive processes communicated mainly through iconic and symbolic media such as visual art and verbal narratives. The literary scholar Joseph Carroll similarly talks of the uniquely human need to create cognitive order, and to make sense of the surrounding world in emotionally and imaginatively meaningful ways through concepts and constructions of religion, philosophy, ideology, science,

as well as through aesthetic fictitious artefacts such as literary narratives – what is often referred to as intellectual or spiritual culture (Carroll 2004: 164, 198).

A particular expression of the teleological need, typically found in religious myth, usually assumes the form of a fictitious narrative describing the origin, history, and ultimate goal of life of an ethnic group, humankind in general, and the entire cosmos with its supernatural beings. This goal is typically conceived of in terms of an imagined ideal future state of humankind, described as a much more attractive version of the currently experienced life situation, and representing a state of optimal satisfaction of all needs – a sort of perfect homeostasis (heavenly bliss, salvation, immortality, return to paradise and so on). This imaged ideal state is linked with positive emotions to motivate thoughts and actions leading towards the attainment of that state, while departures from the set goal are linked with negative emotions and often involve punitive social sanctions, including ostracism, the threat of a loss of the promised ideal state and the attainment of its opposite (hell, damnation, eternal suffering and so on). The ideal future state is often contrasted with usually less than perfect currently lived situation, and is presented as an imaginary compensation of currently experienced discomforts, frustrations, and suffering. The attainment of this postulated perfect homeostasis may even require a deliberate intensification of current hardships and discomforts, by means of ascetic practices for example, or at least by patient forbearance of life's sufferings, in the expectation of the proportionately greater ultimate spiritual reward.

For the teleological models to be effective in satisfying the human sense of the meaningfulness of existence they must be, like all needs, emotionally saturated, motivating actions consistent with the values of the adopted world model and discouraging, by social censure and private guilt, behaviour that deviates from the norms dictated by the model. The teleological world models such as those provided by religion, myth, and the arts thus fulfil a necessary adaptive function of regulating the human cognitive behavioural system by providing emotionally and aesthetically saturated images and moral instruction to produce a sense of total cognitive order of the experienced world. Teleological imagery and narratives also stimulate subjective experience, a person's "inner life," introducing order and meaning into the complex and emotionally rich features of individual life, and explaining one's place within the system of familial and social relations. Teleological world models are indispensable for personal development, for the coherent ordering of ideas and feelings, and for the organization of shared experience that makes collective cultural life possible (Carroll 2004: 128).

Whether or not the universe and human life in it really possess some ultimate purpose and general meaning depends on particular metainformational, ideological assumptions, religious or philosophic, which may or may not reflect the true and objective nature of the world. In this context the answer that science provides

to the question of why we are here is quite unequivocal: human beings, like all other beings, are here for no objective reason whatsoever. Evolution – the main biological explanation of how we arrived in this world – is basically a genetic process, which creates organisms for no purpose except the dissemination of the genes that created the organisms (Dawkins 2006a: 19, 24). At the same time, as Richard Dawkins emphasizes, it is well within the human power to rebel against our evolutionary purpose(lessness), and to say “no” to our genes, as in practising celibacy or in using contraception, thus preventing our genes from copying themselves. *Homo sapiens* is probably the only life form possessing this capacity, together with the desire to ask the teleological why-questions, as evidenced by the history of religious, philosophic, and scientific debates. However, while religion offers self-deceptive illusions as an answer to the question of why we are here, only science appears to be telling honestly and un sentimentally why things happen. In the words of the psychologist David P. Barash, things happen “because of thermodynamic, electromagnetic, or gravitational forces, selection pressure and so forth, including, in many cases, a hefty dose of chaos.” As to the human search for the meaning of life, Barash sees two fundamental possibilities:

One the one hand, we can delude ourselves, clinging to the infantile illusion that some One, some Thing, is looking over us, somehow orchestrating the universe with each of us personally in mind. Or we can face, squarely, the reality that life is meaningless (Barash 2006: 256).

With their built-in compulsion to search for the meaning of life humans are thus caught

between a recognition of life’s biologically based meaninglessness and another recognition, of the responsibility for people to achieve meaning in their lives – not by hiding behind the dictates of dogma, or the promise of a “greater purpose,” but by how they choose to live their lives in a world that is altogether lacking in purpose (Barash 2006: 257).

Barash calls the latter position “evolutionary existentialism”: “In an absurd, inherently meaningless world – our unavoidable evolutionary legacy as material creatures in a physically bounded universe – the only route to meaning is to achieve it by how we engage our own sentient existence” (Barash 2006: 257). In other words, while there is no objective meaning to life, the conscious and teleologically inclined humans can subjectively invent and impose purpose on their own individual and social lives – a purpose that can be just as real and important as if it existed objectively. In a long history of spiritual culture, which until the twentieth century consisted almost entirely of naïve and evasive illusions as to the general purpose and meaning of human life, one of the few honest voices to admit the

objective meaninglessness and purposelessness of existence was that of Samuel Beckett. In his play *Waiting for Godot* (1952) two tramps, Vladimir and Estragon, spend the two acts waiting for Godot, with whom they believe they have an appointment. Towards the end, Vladimir cries to his companion: “We have kept our appointment, and that’s an end to that. We are not saints, but we have kept our appointment. How many people can boast as much?” To which Estragon replies: “Billions” (Beckett 1990: 74). Beckett’s work provides moving testimony to the tragic fact of human existence, in which a strong and compelling cognitive, subjective need to find purpose and meaning in the world and in individual life must inevitably be frustrated by objective absence of any such purpose and meaning. As the anthropologist Weston La Barre notes, the whole edifice of spiritual culture was invented as mere psychological adaptation to inner anxieties, mainly the fear of death and ultimate annihilation (La Barre 1972: 262). Trapped between the unavoidably painful pressure of the teleological need, the inner compulsion to find meaning in life, and the impossibility of ever having this need satisfied and assuaged, Beckett’s tramps and their heroic persistence to withstand the existential vacuum without succumbing to any of the available comforting illusions commands nothing but deepest respect.

Human uniqueness

The presented suite of needs understood as specific types of disturbances of the system’s homeostatic equilibrium is designed to be complete and exhaustive, which means that it should cover all manifestations of behaviour found in empirical systems in their (mostly) contiguous interactions with the environment. In other words, contiguous communication, both among conspecifics and between the living systems and their animate and inanimate environments, is about exchanging information and energies relating to the spheres of life subsumed under the distinguished types of needs: procreative, nutritional, protective, social, exploratory, aesthetic, and (in humans) teleological. It is clear, however, that the particular ways in which these needs are satisfied vary considerably, depending on the systems’ generic characteristics and the environmental niches they happen to occupy. For instance, while all biological systems reproduce, mostly sexually, to provide genetic recombination as a protection against pathogenic micro-organisms, their sexual behaviour exhibits a wide spectrum of forms of courtship as well as varying degrees of care of the offspring. Also, all living organisms, including of course humans, absorb nutritional substances found in their environment to remain alive; all organisms try to avoid being injured or killed by predatory species, enemies, or by accidents; most organisms form groups and coalitions with division of

labour, hierarchy, co-operation and the sharing of resources; and all species have their senses alerted to the ever-changing configurations in the environment to find the most congenial living conditions to satisfy their procreative, nutritional, protective, and exploratory needs.

Humans of course share most of their needs with other living species, although the specifically human cognitive complexity and flexibility both expands and diversifies the ways in which these needs can be catered for in particular cultural contexts. Thus in respect of the procreative need humans can choose to mate either primarily to produce offspring or primarily to enjoy the pleasure of sex, and they can mate both in heterosexual (in the vast majority of cases) or homosexual (in the small minority of cases) relationships, depending on their particular proclivity. Courting, mating, and familial customs also exhibit wide, although not unlimited, cultural diversity, including monogamy, polygamy, polyandry, fosterage and so on. Much of human collective and individual behaviour is also taken up by the search, production, storage, distribution, and consumption of food, historically realized in such forms of economy as hunting and gathering, pastoralism, farming, and most recently in industrial food production. Also, just as all animals spend their lives trying not to get killed or injured, humans too have developed life-protecting institutions such as law, army, police, and medicine, as well as housing and clothing to protect the physical and biological well being of individual members of the society against natural and human threats. On the other hand human ways of catering for the social need include complicated systems of kin and community relations and social hierarchy, with associated customs, laws, and traditions that help ensure social cohesion and collective identity through mutually shared language, territory, historical experience, values, and a sense of loyalty and solidarity with other group members in the face of external threat. The exploratory need in turn is satisfied in humans first of all through natural curiosity we all have about the natural and social worlds that surround us, and secondly through such cultural institutions as formal education, folklore and local history, and other permanent records of cultural memory such as historical monuments, works of art, public archives, science and research institutes, libraries, electronic data bases and so on. The aesthetic need in turn is satisfied by varying degrees of sensitivity to order, form, and harmony expressed through music, visual arts, literature, or simply by silent contemplation of the world, also aided by such social institutions as art schools, aristocratic or state art patronage, museums, and galleries. Finally, all humans want to see purpose and meaning in their individual lives, in the history of their society and of humanity as a whole. On the social level the specifically human teleological need is catered for by religious, philosophic, and political ideologies, which set long-term collective goals and prescribe practical means of attaining them.

It would appear – and it is only a deduction from the presented classification of needs – that in addition to the obvious quantitative differences in the way humans satisfy their needs when compared with other animals, the only qualitative difference is the unique presence in humans of the most advanced of the cognitive needs, the teleological one. As stated earlier, developing abstract theories about the possible origin and purpose of the world is only available to systems capable on the one hand of engaging in metainformational cognitive processes, and on the other hand possessing the extended perception of time, which enables them to hold in working memory the events that happened in the past and to speculate about the events likely to happen in the future. Without this awareness of time embracing the remembered past, the experienced present, and the imagined future human communication would be limited, as it is in other animals, to the here-and-now, that is, to contiguous interactions with the environment. It seems clear that without working memory embracing the extended time-frame no speculation about the possible origin and ultimate goal of things would be possible, just as there would be no need or possibility of engaging in iconic or symbolic communication based on the spatio-temporal displacement between image and original.

In addition to constituting the main qualitative difference between human and the other animals' cognitive faculties, the teleological need and the related capacity for metathinking also affect the way humans cater for all the other needs. A characteristic feature of human behaviour is that the realms of life subsumed under the distinguished types of needs tend to be interpreted metaphorically by means of imaginative connotations extending far beyond the original biological significance of those needs. Thus sex and procreation can be approached by humans both in a literal, animal-like sense, as instinctive means of satisfying the sex drive and of producing offspring, and in a specifically human way, by transposing the biology of sex and procreation onto a symbolic plane and re-interpreting them as, for example, a manifestation of the divine *hierosgamos*, the union of male and female divine principles, the wedding of Christ with Mother Ecclesia, the alchemical *coniunctio oppositorum*, the astrological conjunction of Mars and Venus, the Taoist *yin* and *yang* and so on. Likewise, the nutritional need can be both a way of satisfying physiological hunger and an element of symbolic culture, when it is governed by ritual dietary laws for example, and when food acquires religious significance, as in symbolic consumption of the mystical body of Christ, conceived as a spiritual union between the deity and the believers. The protective need reduces the risk of loss of life and of physical injury, and at the same time it can also be reinterpreted symbolically as a metaphysical struggle between the forces of good and evil, or it can be turned into a holy war in defence of god's cause and so on. Similarly, the social need both ensures the cohesion and solidarity within families, local and ethnic groups, and can give rise to such meta-concepts as god's chosen

people as opposed to infidels, or civilized nations as opposed to barbarians. By the same token the exploration of the environment in search of vital resources needed for survival can be reinterpreted symbolically as a search for the golden fleece or the holy grail, just as the emotive evaluation of the elements of the natural environment in terms of their adaptive usefulness can assume the form of meditative appreciation of the beauty and the sublime in nature. Finally, the teleological need requires by definition the uniquely human meta-cognition, which invests everything people do with a sense of transcendental meaning and purpose, as illustrated by the traditional concepts of fortune, fate, divine providence and theological eschatology as putative explanations of the ultimate goals of an individual life, of a nation, humankind, and the entire cosmos.

Humanism versus dogmatism

If a need is to be understood in terms of homeostatic disturbance of the system's functional equilibrium in its relations with the environment, an adequate satisfaction of the need should theoretically restore the upset balance and ensure the system's optimal, need-free existence. However, in practice perfect and continuous homeostasis is never possible, nor is it desirable. Except in such symbolic concepts as the garden of Eden or heavenly Jerusalem with their promise of perfect and eternal happiness, a complete satisfaction of all needs is never possible, both because the external environment never remains static, constantly providing new stimuli to keep disturbing the system's functional equilibrium, and because the system's internal states constantly change due to on-going metabolic, physiological, and cognitive processes. Perfect homeostasis is also an undesirable state, because some degree of stress, that is, mild disturbance of functional equilibrium, is a sign of active and healthy life. In the words of Ludvig von Bertalanffy,

stress is not only a danger to life to be controlled and neutralized by adaptive mechanisms; it also creates higher life. If life, after disturbance from outside, had simply returned to the so-called homeostatic equilibrium, it would never have progressed beyond the amoeba which, after all, is the best adapted creature in the world – it has survived billions of years from the primeval ocean to the present day (Bertalanffy 1973: 203).

In other words, without some degree of continuing instability in the relations between living systems and the environment, progressive evolution of the biosphere leading towards the ever-increasing organic complexity would not be possible. In fact, the only time a living system establishes a perfect homeostatic balance in its

relations with the environment is when it stops processing information and energy; in other words, when it is dead.

While the state of homeostatic near-balance, involving some degree of healthy stress and alertness to environmental changes, appears to be an optimal behavioural strategy in all animal species, the specifically human cognitive distance from contiguous behaviour afforded by metathinking can theoretically result in radical, even counter-adaptive modifications in the ways humans satisfy their needs. As is illustrated in the expanded model of communication (Figure 9), metainformation is normally linked to parainformation through negative feedback, which means that certain instinctive, adaptive responses can be reinterpreted not just in terms of symbolic extension but of opposition or negation, as dictated by particular religious, philosophic, or political ideologies. Indeed, the teleological need, this uniquely human cognitive phenomenon generated entirely by metainformational processes of the mind, is responsible for radical modifications of human behaviour of the kind not found in the animal world. Depending on a particular ideological requirement human needs can be either optimally catered for, or they can be denied, condemned as “evil” or “sinful,” and repressed in the name of some “higher” ideal. In this way an ideologically motivated negative attitude towards sex and procreation for instance can result in doctrinally induced sexual guilt, in celibacy and the cult of virginity; a negative attitude towards the nutritional need can lead to self-deprivation and fasting; the denial of the protective need can result in ascetic mortification of the flesh, self-mutiliations, martyrdom, or the cult of honorary suicide; the denial of the social need can produce monasticism and self-inflicted isolation of hermitism; a negative attitude towards the exploratory need can lead to doctrinal condemnation of natural curiosity, persecution of freethinkers and heretics, and official bans on independent intellectual or scientific inquiry; a negative attitude towards the aesthetic need can result in puritanic, philistine disapproval of beauty and pleasure as ungodly, decadent and indecent; while in the sphere of the teleological need a negative attitude can lead to intolerant dogmatic stipulations, usually accompanied by oppressive sanctions for non-conformists, as to which particular creed all people should obligatorily embrace. The positive (approving, tolerant) attitude towards all human needs can accordingly be called *humanistic*, or *liberal*, while the negative (disapproving, intolerant) attitude towards needs can correspondingly be called *anti-humanistic*, or *dogmatic*.

In humanistic ideologies and corresponding value systems the aim of life is thus the optimal satisfaction of the needs of all people, as long as specific individual or group needs do not conflict with the needs of others. On the other hand in anti-humanistic ideologies the aim of life is individual self-denial and the glorification of a collective, rigidly followed dogmatic ideology. Historical examples of socio-cultural systems organized around humanistic principles in the above sense

include the philosophic elites of the Greek polis from the sixth century BCE onwards, the progressive trends within the European Renaissance, and the liberal mainstream of today's Western societies. On the other hand examples of anti-humanistic, repressive social systems include the religious orthodoxy of the European Middle Ages, puritanism as an attitude whenever it appears, communist totalitarianism and all kinds of contemporary religious fundamentalisms. If the needs and the tendency towards their optimal satisfaction are part of human genetic endowment, which means that they cannot be erased or culturally reprogrammed, one would predict that humanistic, liberal societies generally make people happier than repressive societies, as indeed appears to be confirmed by spontaneous human migrations, which tend to move from repressive to liberal countries rather than the other way round.

From emotive vocalizations to bodily adornments

The origins of referentiality

Human responses to the environment thus occur in certain typical situations as circumscribed by the distinguished needs: procreative, nutritional, protective, social, explorative, aesthetic, and teleological. In the overwhelming majority of cases adaptive behaviour occurs in the context of direct, contiguous communication; in other words, it relies on reacting to various environmental stimuli occurring here and now within the natural sensory zone of the receiver. In most situations, especially among non-human animals, communicative behaviour does not extend beyond these contiguous interactions, but it is clear that contiguous communication is also a prerequisite for other, cognitively more advanced forms of communication, involving spatio-temporal displacements between originals and images found in indexical, iconic, and symbolic communication.

Academic disciplines such as communication studies, cultural studies, literary theory, linguistics and semiotics as a rule focus on specifically human forms of communication, notably the symbolic one which however, from a broader perspective constitutes only a part of communicative behaviour, even in humans. At least just as important are the much more ubiquitous, and for that reason probably considered too obvious, contiguous interactions with the social environment, which are usually the domain of psychology and sociology rather than of communication studies or semiotics. Notwithstanding the importance of audio-visual mass media and print in social communication, it is good to remind ourselves that alongside the information bombarded at us from television, the Internet, radio, CDs, DVDs, computer games, cinema, newspapers, magazines, books, billboards, leaflets and so on, the bulk of social communication still occurs during direct, face-to-face, spontaneous and unmediated social interactions. People may enjoy watching their favourite programmes on television, or just succumb to random channel switching; they may spend hours every day surfing the Internet or playing computer games; they still attend cinema screenings or build their private DVD collections; they have radio played in the background or listen to their favourite music on I-pods for most of the day practically wherever they go; they have the

habit of at least scanning the newspaper headlines or reading the traditional book; their attention is inadvertently drawn to TV commercials, street posters, billboards, and leaflets dropped on their doorsteps or handed out in the street, and so on. At the same time people still enjoy the daily chat and gossip with the family, friends, neighbours, and work mates; many practically never part with their mobile phones, exchanging frequent calls, text messages, and emails on most trivial matters; and they love gathering to socialize and schmooze at homes, in pubs, cafés, shopping malls and other public places. Notwithstanding the mass media's competition for our attention and their influence on our views and opinions, there is simply no substitute for spontaneous contiguous communication with other people, because, as I argued earlier, the need for social intercourse is simply part of ineradicable human nature.

Even participation in organized communal events, unless coerced against people's will by oppressive regulations such as those imposed in the past by totalitarian regimes, would not be possible without the individual innate need for social contact. Given the choice between watching a football match on television in the comfort and privacy of one's living room, and sitting in a crowded stadium in often inclement weather many people still prefer the latter, because direct, contiguous interactions with the environment are for many reasons more attractive and exciting than indirect, indexical, iconic, and symbolic forms of communication, with their spatio-temporal displacement and the resulting sensory and cognitive alienation from the experienced event. A football fan sitting in the stadium watches the game from a long distance and from one angle only, while a televised transmission offers a multi-camera, elaborate visual spectacle presenting the game from many angles, with close-ups revealing important, otherwise unseen details, with replays and slow motion to repeat and prolong visual excitement and to offer an opportunity for closer scrutiny of the action, accompanied by commentaries by sports experts and so on. Still, our sensory and cognitive systems appear to be geared primarily towards registering the manifold environmental stimuli occurring here and now around us, in our immediate physical space, because in many situations these direct stimuli are more likely to affect our survival than information communicated to us through icons or symbols, often referring to events distant in time and space and therefore immediately less urgent or dangerous. This is why social life has always revolved around live, contiguous communal events that appealed directly to the eye and the ear, and often also to the nose and the tactile sense: tribal rituals, religious ceremonies and processions, gladiatorial combats, medieval jousts and tournaments, military parades, coronations, triumphal entries of victorious military commanders, street theatre and other public spectacles such as masques, plays, ballets, concerts and operas (Briggs and Burke 2005: 33–36). The need for contiguous, multi-sensory, direct interactions with one's social environment

explains why live communal spectacles are still popular today, in the age seemingly dominated by indirect, electronic mass media of radio, television, video, DVD and recorded music available easily and cheaply in the comfort of our homes.

In other words, there is no substitute for the “real thing” to excite our senses and stimulate our minds, which is for instance why lovers of music, possessing private CD collections of their favourite pieces brilliantly performed and impeccably recorded by world-class musicians, still attend live concerts which often offer inferior quality of sound and performance when compared with the original studio recording. By the same token reading about celebrities in gossip magazines or watching them on television chat shows can be exciting enough, but spotting a celebrity in a public place, or meeting them personally, if only to shake their hand or to have a picture taken with them, can be for some people ecstatic beyond description. Similarly, reading travel literature, listening to other people’s stories about foreign countries, or watching films showing how the other half lives are also enjoyable, but for most people not as much as experiencing foreign travel directly, as the booming tourist industry incontrovertibly demonstrates. For similar reasons it is difficult to see online courses and distant learning ever completely replacing traditional, face-to-face interactions with the teacher in the classroom context. At the risk of elaborating the obvious, important as indirect communication is in distinguishing human culture from animal behaviour, the multi-sensory experience of contiguous interactions with the environment, so crucial from the adaptive point of view, as a rule excites much stronger emotions and seems more “real,” because it activates specialized cognitive modules designed by evolution to aid survival in direct, potentially life-threatening situations.

The modules in question, as evolutionary psychology demonstrates, are functionally specialized and interrelated problem-solving cognitive devices, each dedicated to a specific type of behaviour related to a typical adaptive situation. The cognitive modules and the innate predispositions they generate influence every aspect of human behaviour, including cognition involved in contiguous communication, the psycho-physiological structure of personality, sexual identity, family functions, individual roles in social structures, our relations to the non-human physical and biological environment, as well as such specifically human behavioural manifestations as art, literature, religion, philosophy, and science (Wilson 1978: 20; Fodor 1983; Barkow, Cosmides and Tooby 1992: 5; Cosmides and Tooby 1994: 91; Samuels 2000: 13; Carruthers and Chamberlain 2000: 3; Boyer 2000: 95; Cartwright 2000: 193; Workman and Reader 2004: 21; Carroll 2004: vii, 23, 191).

Defining index

The first step towards spatio-temporal separation of sender from receiver takes place during indexical communication. Index, as I defined it in Chapter 2, refers to a physical change (information) produced by sender in the environment upon direct physical contact, whether intentionally or unintentionally, as exemplified by a fingerprint, a signature, a photograph, a shadow, a voice or a smell. The number of rings found in the cross-section of a tree trunk is also an unintentional (of course) index of the age of the tree, because growth causes a new ring to form each year. I also distinguished three types of situation in which indexical communication can take place: first, when the change is spatio-temporally co-present both with sender and receiver, as illustrated by one's reflection in the mirror, a perception of someone's shadow, voice, smell, or by gauges of any kind, such as speedometer or thermometer – what I called contiguous indexical communication; second, when the change is contiguous both with sender and receiver, except that receiver is spatially displaced from sender, as illustrated by a telephone conversation or a live television transmission – what I called simultaneous indexical communication; and third, when the change is spatio-temporally displaced from sender but contiguous with receiver, as illustrated by a footprint, handwriting, print, a seal, photography, film, voice recording and so on – what I called displaced indexical communication, which is probably the most important form of indexical communication, because most distinct from contiguous communication.

In C. S. Peirce's classic formulation "An *Index* is a sign which refers to the Object that it denotes by virtue of being really affected by that Object." Also, "in so far as Index is affected by the Object, it necessarily has some Quality in common with the Object, and it is in respect of these that it refers to the Object" (Peirce 1998: 143; Greenlee 1973: 70). Peirce's index "being affected by" the object corresponds to my perhaps stronger requirement that index be in fact physically *caused* by the object (sender), without which index simply could not exist. For instance, a shadow cast by a tree is not just "affected" by the tree; it is fully caused by it. Peirce also rightly emphasizes that "indices have no significant resemblance to their objects," because "their action depends upon association by contiguity" (at origin, I should add). Indeed, a signature on paper bears no outward physical resemblance to the person who wrote it down, just as personal odour in no way visually or otherwise resembles the person who emitted it.

There is, however, a necessary if tenuous physical link between sender and index in that the latter forms a new system, distinct from sender but produced by it in the environment, and therefore retaining some of the qualities of the sender. In fact, indexes such as voice, smell, or handwriting are as idiosyncratic and unique as faces and individual personalities, which is why for instance a written signature

can be used as a guarantee of identity on bank cheques and other important legal documents. The indexicality of handwriting also explains why graphologists claim to be able to infer some personality traits from a person's style of writing, and why a smell of sweat contains chemical properties unique to the person who emitted it. For example, police dogs can distinguish between any two human beings by smell alone, with the exception of identical twins. Most forms of animal communication have indexical quality, from pheromonal odours (which indicate the animal's proximity and its physiological or emotive state), to alarm calls (which indicate the animal's fear and indirectly the presence of a predator). Peirce's examples of a photograph, a barometer, and a weathercock also appear to concur with the above definition of index. A photographic image on negative or printed on paper is a new system produced by light reflected from the photographed object and possessing some visual properties of the latter. The mercury in a barometer is a system distinct from the changes in atmospheric pressure which cause the mercury to expand or contract. Likewise, the turns of a weathercock caused by gusts of wind are related to but physically different from the changes in the direction of the wind that causes the weathercock to turn.

But Peirce's definition of index is also broader and somewhat vaguer than the one proposed here. For example, Peirce includes in this semiotic category any instances of "indicating" in human communication: demonstrative pronouns or adverbs (*this, that, here, there*), their gestural equivalents such as pointing at things with a finger or stick, and all kinds of verbal instructions and commands such as *See there!*, or *Look out!*, an understanding adopted after Peirce by Thomas A. Sebeok and the cognitive archaeologist Iain Davidson (Peirce 1998: 161, 165; Sebeok 1994: 72; Davidson and Noble 1993: 383). Strictly speaking, however, demonstrative words or pointing gestures are not indexes, because they do not produce any physical changes in the environment outside the sender. Except in fairy tales no object is created or otherwise affected physically by being pointed at with a finger or with a magic wand: the gesture should rather be classified as an icon, because the line of the finger or stick imitates the extended line at the end of which the indicated object is situated relative to the pointer. For this reason Steven Mithen correctly refers to the pointing gestures used by the gorillas as iconic rather than as indexical devices: here the path of the gesture matches the desired path of body movement (Mithen 2005: 119). Similarly, verbal instructions or words such as *here* or *that*, interpreted by Peirce as indexical, only "indicate" things they refer to in a semantic, mental sense, without in any way physically affecting the indicated place (as in *here*) or object (as in *that*).

Likewise, Sebeok's expanded understanding of index inspired by Peirce appears to include what according to my earlier definition constitutes not indexical but direct, contiguous communication. Using as an example the autonomous

system of a living cell, Sebeok interprets its reactions such as changes in magnitude or shape, secretion of chemical substances, movement versus immobility and so on in terms of indexical signals (Sebeok 1994: 68). However, changes in the cell's shape or position appear rather to be part of the cell's simple contiguous interactions with its environment rather than indexes. On the other hand chemical substances secreted by the cell do produce a change in the environment, and can therefore be classified as indexes. In another example Sebeok interprets animal droppings, hairs, feathers, and threads of saliva detected by a hunter alongside animal footprints, snapped twigs, or smells as indexes of an unseen quarry. Again, according to my definition traces such as droppings, hairs, feathers, saliva and so on are really metonymic cues (not signals or signs because produced unintentionally), due to the fact that they originally formed an integral part of the animal and were not produced as a new element of the environment. That is to say, animal droppings (metonymic cues) were originally a part of the animal, whereas footprints in the ground (indexes) were not. By the same token evidence collected by forensic scientists during police investigations does not consist entirely of indexes, as Sebeok again proposes, but also of a mixture of indexes (fingerprints, CCTV footage and so on) and contiguous metonymic cues (drops of blood, traces of DNA, hairs and so on). Sebeok also includes religious relics, such as saints' bones, among indexes, but because these objects too were originally a part of the saints' bodies they should probably again be classified not as indexes but as contiguous metonymic signs (not as cues or signals because they are now invested with symbolic, that is, metainformational meaning) (Sebeok 1994: 65, 72).

Incidentally, the most famous displaced indexical sign of Christianity is probably the Turin Shroud, a piece of cloth allegedly containing an imprint of Christ's body taken from the cross. The furore surrounding this relic among some people is perhaps understandable from a religious point of view, but one can speculate that the excitement would probably be much greater if for example something like Christ's bone or lock of hair were ever to be found. The difference in emotive response would be due to the fact that a contiguous metonymic sign (a bone) would be an integral physical part of, and therefore closer to the "real thing," while an index (the image on the shroud) is only a displaced imprint of the object in question, like a death mask, that is, a plaster cast of a dead person's face, or like a photograph. The distinction between metonymic cues and indexes is not purely academic, because it can have important practical implications. For instance a bullet hole in the wall is a displaced index, whereas the bullet itself embedded in the hole is a contiguous metonymic cue, which from a forensic point of view constitutes a more important piece of evidence than the hole alone. The bullet, by virtue of being once an integral part of the weapon used in the crime, can help identify that

weapon and possibly lead to the arrest of the suspect, whereas a bullet hole on its own is only a general indicator that some shooting has taken place.

In his broad definition of index Sebeok also includes certain types of cues and signals that should probably be classified as part of fully contiguous, direct communication of the type discussed in Chapters 3. Sebeok's extended indexes include for example some expressive features of human behaviour such as physiological reactions and emotive elements of speech that reveal personal characteristics (Sebeok 1994: 76). But signals such as facial expressions, gestures, bodily postures, and emotive vocalizations can hardly be treated as indexes, because they are part of the reacting system and do not exist outside of it (unless they are photographed or recorded on a tape, in which case they do of course become indexes). Admittedly, these communicative bodily features do contain rudimentary referential function by exteriorizing the inner and therefore unseen mental, emotional, and physiological states of the sender, but they are still fully contiguous with these states. These physiological, semi-referential, involuntary bodily cues are what Sebeok refers to as *symptoms*, which he defines as "compulsive, automatic, non-arbitrary signs, such that the signifier [an external physiological reaction] is coupled with the signified [the relevant inner state] in the manner of a natural link" (Sebeok 1976: 42; 1994: 24). Thus profuse sweating and body trembling can be interpreted as symptoms of fear, blushing as a symptom of shame, goose pimples as a symptom of reduced body temperature, vomiting as a symptom of upset stomach, fever as a symptom of disease, just as the complete immobility of a lying animal can be interpreted as a symptom of death.

On the other hand intentional, that is, cognitive and emotive rather than purely physiological inner states are communicated contiguously during social interactions by means of what I defined earlier as signals, that is, outward expressions (mostly visual and auditory) of hidden thoughts, intentions, and emotions. Contiguous bodily signals dominate almost entirely in animal communication, and they are still of paramount importance among humans, where they are complemented by indexical, iconic, and symbolic signs communicating information about displaced originals. From the point of view of the evolution of communication, the involvement of rudimentary displacement between original (inner state) and image (outward expression) in bodily symptoms, cues and signals constitutes therefore the first step towards fully indirect, referential indexical communication.

Bodily signals and the beginnings of referentiality

For evolutionary reasons visual, auditory, olfactory, gustatory and tactile signals used by higher animals are principally related to sexual life (calling, courting, and

mating with the partner, as well as expressing jealousy and rivalry), family life (feeding, grooming, patting, embracing), and social life (using vocal signals, gestures, and body postures to mark hierarchy and territory, producing alarm calls and information about food *etc.*). Bird singing for example has two main functions: repelling rivals and attracting mates (Busnel 1977: 242; Slater 2000: 49). The primates, our closest animal relatives, also use complex vocalizations, which are particularly interesting from the point of view of the origin of human language. The primate vocal signals consist of various grunts, barks, screams, hoots and roars, each with a distinct message relating to a specific, contiguously relevant problem. The number of distinguishable primate calls, according to one estimate, never exceeds thirty, but most calls allow for some variation in loudness and frequency, which appears to reflect the intensity (an iconic feature) of the state that elicits them (Dingwall 1979: 27). Predictably in the animal kingdom, the vocalizations used by apes and monkeys are affective in character, being invariably tied to various emotional contexts such as threats, aggression, fear, pain, pleasure, feeding, separation and so on. According to the anthropologist Christ Knight, primates use complex, multi-sensory vocal, acoustic, and tactile displays including postures and facial expressions to negotiate the intricate social attitudes of dominance, submission, appeasement, threat or sexual arousal. It is also from these primate displays that the human repertoire of gestures, smiles, frowns and other hard-to-fake emotional expressions such as laughter, crying and so forth ultimately derives (Knight 1999: 229). In fact, compared with other primate species humans can avail of relatively few innate emotive vocalizations: these only include, according to the evolutionist Terrence Deacon, the six reactions of laughing, sobbing, screaming with fright, crying with pain, groaning and sighing. By comparison, the repertoire of innate vocalizations in other primate species ranges from fifteen to forty, their limited number in humans being due to the predominance of symbolic language in social communication (Deacon 1997: 418).

When it comes to expressing emotions, the affective bodily signals, phylogenetically older than verbal language, still form the most efficient channel of human interpersonal communication, especially in intimate contexts. For example, facial expressions, often combined with emotive vocalizations, constitute a universal medium of emotional, non-linguistic communication capable of conveying subtle feelings probably inexpressible in verbal language (Wilson 1978: 23; Workman and Reader 2004: 122; Etcoff 1999: 34; Hauser 1998: 357, 361; Nelson and de Haan 1997: 183; Ekman and Friesen 1975; Ekman 2003: 58; Russell and Fernadéz-Dols 1997: 10–13; Brown 1991: 134). Among the many surviving vestiges of this archaic expressive communication are laughing with joy, shouting in derision, crying from pain, growling in anger, gasping in astonishment, talking in “motherese” with infants, giggling and cooing among lovers, exclaiming and screwing up the

face with disgust and so forth. The particular outward expressions of inner emotional states also appear to be non-arbitrary and therefore universal, based as they are on somatic and physiological reactions that cut across cultural barriers. According to Robin Dunbar laughter, found in all known societies, is a particularly good releaser of endorphins, chemicals known as opioids, which function as pain killers, inducing a feeling of relaxation, well-being, and positive disposition towards other people (Dunbar 2005: 126–128). For Merlin Donald these emotional, largely involuntary expressions would have been useful visual and auditory communication devices in the intimate family and tribal group that probably characterized early hominid culture, before emotions, intentions, and other mental states started being translated into less affective, symbolic verbal language and iconic images (Donald 1991: 180).

Physiological symptoms, emotive cues and signals can thus be regarded as a transition between contiguous communication, in which what we see is what we get, and indirect, referential forms of communication, in which what we see is only a reflection (index) of a hidden cause. In bodily symptoms, cues and signals we are already dealing with rudimentary spatial displacement between original (an unseen inner state) and image (outward facial or bodily expression and vocalization), which for some scholars already constitutes reference, that prerequisite of communication. For Terrence Deacon for instance even a bodily symptom refers to something other than itself, that is, to the inner state that generated it, while some animal vocalizations can even refer to something other than the body that produced it, as is the case with animal calls warning against proximate predators (Deacon 1997: 352).

In this context Marc D. Hauser speaks of “functional referentiality” in relation to adaptively significant signals such as warning or mating calls in animal communication (Hauser 1998: 507). In such contiguous calls there is a correspondence or association between the structure of the emitted signal and the emotive state experienced by sender at the time of emission. Thus human newborns produce acoustically differentiated cries associated with pain and anger, in much the same way that rhesus macaques use acoustically differentiated calls associated with fear. In both humans and nonhuman primates, one typically infers the emotional state underlying the acoustic signal from several external cues, including non-acoustic signals such as facial expression, body posture, and the social context responsible for eliciting the signal (Hauser 1998: 505). Hauser also calls some animal signals “representational,” so that for example an alarm call given in response to a leopard would be semantically analogous (at least in the literal, parainformational sense) to the human word “leopard,” if it were also given in response to a real leopard, and if it was meant to elicit behaviourally appropriate responses from other humans nearby (Hauser 1998: 508). Field research conducted by primatologists D. L.

Cheney and R. M. Seyfarth also indicates that vervet monkeys use different vocalizations that convey information about specific predators such as leopards, snakes, and eagles. Each of these predators requires different evasive action: climbing a tree (leopard), standing on hind legs and looking into the grass (snake), and looking up in the air or diving straight into the bushes (eagles) (Cheney and Seyfarth 1990; Allen and Sidel 1998: 185; Cosmides and Tooby 1994: 89). The ability to identify an external enemy, to warn other group members by means of a specific call corresponding with the enemy, to understand the call and to take appropriate evasive action all appear to indicate that animal calls and visual signals (such as panicky behaviour) are not only symptomatic, in the sense of communicating inner emotive states, but can also be representational, in the sense of referring to a relevant object in the external environment (Hauser 2000: 78).

Reference and representation are thus not limited to human iconic or symbolic communication, but are in fact ubiquitous among animals living in groups and equipped with sufficiently advanced sensory and cognitive apparatus to register, produce, interpret and exchange cues and signals observed in the environment or emitted by other animals. Interestingly, most mammals appear to be more attuned to olfactory or vocal cues and signals than to visual ones, by being able to interpret odours and sounds as indexes of other unseen but contiguously co-present animals. For example, the chimpanzee hunters rely on acoustic cues to locate their prey, altering the direction of pursuit when they hear the grunting of forest hogs. On the other hand visual cues are apparently more difficult for primates to observe, and for instance vervet monkeys seem unable to understand the danger implied when they see the visual indexes of their predators, such as the trail left by a python or the carcass from a recent leopard kill. Chimpanzees too are poor at drawing inferences from visual indexes, being unable to interpret the animals' tracks left on the ground – a skill mastered by all human hunters (Dunbar 1995: 121; Mithen 1999a: 80). Still, referential communication, mostly olfactory and auditory, is amply illustrated by animal behaviour, the fundamental difference between animal and human forms of communication remaining in the level of meaning, which differs depending on the species' needs and the organization of their nervous systems. In animals reference is symptomatic, sometimes indexical or even iconic, but generally parainformational and nearly always contiguous. On the other hand in humans reference is symptomatic, indexical, iconic, symbolic, and generally metainformational. Another important difference is that most animal signals are innately motivated, resulting from the multigenerational history of the individual's genetic material that favoured a particular signal as a response to a given proximate situation (Morton 1994: 349). By virtue of not possessing blank minds at birth humans too are equipped with instinctive responses to certain typical adaptive situations which, however, can be modified (mitigated or enhanced)

or even overridden by culturally driven symbolic values, largely resulting from the dictates of the specifically human teleological need.

Bodily adornments as the first indexical signs

If physiological and emotive bodily symptoms, cues, and signals form the first step towards referential communication, then artificial extensions of the body found in human cultures, such as skin decoration, makeup, jewellery, head dress, clothes and so on can be called indexical signs (more precisely, contiguous indexical signs) in the full sense of the term. While bodily signals are a form of extended phenotype, that is, they remain an integral part of the body and its physiology, bodily adornments originate outside the body, and technically speaking form a separate system (index) produced by a person as the reacting system. This is why a peacock's colourful tail developed by evolution to attract females by advertising its owner's phenotypic quality is an example of a bodily signal, whereas the feather head dress of a native American tribal chief is a contiguous indexical sign announcing its wearer's social status and authority.

Contiguously indexical bodily adornments used by humans probably appeared at least during the Upper Palaeolithic cultural "explosion" around 40,000 years ago, together with the earliest instances of permanent displaced iconic signs such as the realistic paintings found in the caves of southern France and northern Spain. Unlike the inadvertent cues and intentional but genetically motivated bodily signals used by animals, contiguous indexical signs produced by humans as extensions of their bodies are already a part of culture, although their production is no doubt facilitated by specialized, evolutionary older, animal-like cognitive modules designed to draw attention to one's body to attract mates, to scare opponents, and to indicate one's status within the group (Etcoff 1999: 36; Gibson 1993a: 11; Mithen 2005: 155; Lambert 2004; Ingold 1993: 35; Kendon 1993: 48–53; Dingwall 1979; Provine 1997: 170–173). Indeed, contiguous indexes in the form of bodily adornments belong to human cultural universals, attested among all documented hunting-gathering, farming and urban societies, and they include such practices as body painting, ritual scarring of the face and torso, elaborate hair arrangements, refinements of costume, face makeup and masks. These adornments may have their further, mimetic (iconic) and quasi-symbolic significances, as Merlin Donald and Steven Mithen suggest, such as the indication of one's status, group affiliation, and relationships with other individuals, what in today's societies is symbolized by a uniform or a wedding ring for example (Donald 1991: 277; Mithen 1999a: 173). However, any possible meta-meanings of bodily decorations hinge upon their primary indexical character as contiguous, emphatically

conspicuous extensions of the relevant parts of the body sending socially important messages.

An interesting hypothesis to explain how the transition from animal body signalling to human indexical bodily signs could have occurred in our evolutionary history has been advanced by the anthropologist Camilla Power (Power 1999: 93–109). From a Darwinian point of view any lasting biological or cultural invention owes its durability to its usefulness, in practice to the extent in which it enhances individual fitness, that is, survival and/or reproductive opportunities. This is why some of the most important bodily signals in animals serve the procreative need, by announcing fertility and the readiness to mate. Among most mammalian females the oestrous cycle, that is, the period of fertility and therefore of sexual receptivity, is communicated outwardly with a fanfare of signals, such as the swelling and reddening of the skin around vagina, emission of menstrual blood (among apes and primates) and of distinctive odours, by provocative, inviting behaviour and so forth. In humans, for reasons that are still debated, ovulation is concealed both for male and female, which may explain for instance why many traditional societies saw virtually no link between copulation and conception (Cartwright 2000: 226–231).

According to Camilla Power, concealed ovulation in women evolved as a way of confusing or deceiving men about the precise period of the women's fertility, otherwise symptomized externally only by menstruation. At some point in the evolution of archaic *Homo sapiens* overt symptoms of ovulation (indicating current fertility) had been lost, and females had to invent a means of forcing male attraction and sustained support, especially in the form of supplies of energy-rich food. Menstruation, the most prominent cue of imminent fertility, and a means of keeping the male interested in the female, is something that no male could afford to ignore without risking his mating prospects. At the same time a menstruating female is a potential threat to any other pregnant or lactating female, by being able to divert the energy and investment of all males to herself. Therefore the archaic *Homo sapiens* females, argues Power, may have avoided reproductive stress and jealousy over males by adopting a reciprocal coalitionary strategy of manipulating menstrual signals. Thus whenever a coalition member menstruated, the whole coalition joined in advertising this valuable signal as widely as possible to confuse males and ensure a more equal distribution of their reproductive and supportive attention to all females. Non-menstruating women would confuse and deceive males either by borrowing a menstruating woman's blood, or by mimicking it with other blood or blood substitutes such as red ochre. Such cosmetic manipulation of menstrual cues has been termed "sham menstruation," and it is hypothesized that it was practised by a coalition of all fertile women alternating naturally in their

ovulation periods between phases of fertility and non-fertility (Power 1999: 99; Knight 1999: 242; Cartwright 2000: 228–233).

Within the coalition of menstruation faking women one would also expect a competitive dynamic to attract males by producing increasingly elaborate sham menstrual advertising, resulting in ritualistic amplification of indexical, sexually sensitive bodily displays. These could involve the use of red pigment to amplify and broadcast the menstrual cues, with additional multimedia effects of movement, song, and dance to further advertise the women's phenotypic quality, that is, physical fitness as a symptom of good health and fertility. A possible implication of the sham menstruation theory is that one of the earliest expected evidence of human indexical signs should be cosmetics focused on red pigment. Another implication of the theory is that the deception practised by menstruation faking women should be socio-centric rather than individualistic or egocentric. Human females organized in the sham menstruation coalitions would create permanent indexical signs and associated imaginary constructs, which they would share with other members of the coalition as well as with men outside the coalition.

In support of Power's theory ethnographic studies show that cosmetics, often involving the menstruation mimicking red pigment, are indeed ubiquitous in modern tribal puberty and nubility rituals, where they are manipulated by coalitions of women to attract male attention. Among the peoples of the Lower Congo, for instance, red pigment forms the most often used ingredient of beauty preparation, where it connotes physical attractiveness and sexual maturity. Applied to modern societies the sham menstruation theory may also explain the perennial male erotic interest in women's red lipstick, rouged cheeks, crimson dresses, and not least in the red-light districts with their "red queens" (Ridley 1994: 269–296). One of the bestsellers of medieval literature, the allegorical *The Romance of the Rose*, culminates in the male lover's all-too-literal conquest of the vagina-like red rose (Lorris & De Meun 1994: 333).

From a semiotic viewpoint Camilla Power's theory of sham menstruation throws light on an important transition from animal-like communication based on inadvertent bodily cues to fully human communication based on artificially made and socially shared indexical as well as imitative, that is, iconic signs. Indeed, Power infers that female strategies involved in sham menstruation eventually led to the emergence of iconic and symbolic culture, and can therefore account for the putative origin of art (Power 1999: 107). Body-painting used to inform or deceive males about female imminent fertility, combined with dance and singing as ways of attracting attention to the female body, could constitute the earliest art media involving contiguous indexical and iconic visual and auditory signs, long before the appearance of durable representational images (displaced icons) painted or carved on surfaces other than the human body, such as wood, animal skin,

bone or rock. Despite the scarcity of material evidence we can strongly hypothesize that for tens, if not for hundreds of thousands of years before the onset of recorded iconic culture around 40,000 years ago, forces of sexual selection drove the cosmetic body-paint traditions by competitions between female ritual coalitions and male mate choice for cosmetically decorated females. Steven Mithen reports that fragments of red ochre were found in sites dating as far back as 250,000 years ago, and large quantities of red ochre were also found in man-made deposits from at least 125,000 years ago in Africa (Mithen 1999a: 27; Donald 1991: 277; Davidson 2003: 154). It is generally accepted among archaeologists that the earliest use of ochre was for proto-symbolic body decoration rather than for painting cave walls or other artefacts. In the Upper Palaeolithic cave art low reliefs representing women, with large sagging breasts and bulging, broad thighs, were often heightened with red ochre (Leroi-Gourhan 1968: 117). The colour red, on its own or even more so when applied to selected parts of the female body such as lips, buttocks and breasts, produces a range of physiological effects, including acceleration in heart rate and stimulation in certain parts of the brain, and for this reason it is the privileged colour in all cultures (Mithen 1999b: 154; 2005: 251).

As the psychologist Nancy Etcoff also convincingly argues, our innate responses to red colour, especially in the context of sexual behaviour, explain why still today most women apply attention catching points of red to their lips and cheeks, in addition to powder that is a shade lighter than their natural complexions, to bring out the redness of the lips and cheeks even more. The light foundation and blush on the cheeks and red on the lips are thus sexual signals mimicking the blush of youth, nulliparity, and the vigour of health (Etcoff 1999: 113). Red, the colour of blood, of blushes and flushes, of nipples, lips, and sexually excited genitals, is visible from afar and emotionally arousing. The attention-grabbing and emotionally-stimulating properties of red also explain why it is the colour of stop signs, railway signals, fire engines, some national flags and political emblems.

If women's use of red pigments on erotically sensitive parts of the body can be regarded as the first instance of contiguous indexical signs, so can skin painting and body decorations used by men. One of the innate cognitive modules of the human social mind appears designed to produce and read indexical signs used by both sexes as extensions and modifications of their bodies to advertise sexual attractiveness, physical prowess, and social status (Boyer 2000: 95; Sadowski 2001c: 70; Symons 1979: 22; Pinker 1998: 484, 468; Etcoff 1999: 146, 164, 246; Guthrie 1970: 259; Buss 2004: 251). These indexes include such universally attested body decorations as makeup, tattoos, skin piercing, jewellery, head dress, elements of clothing, talismans and so on. Unlike the historically more recent displaced iconic representations produced on durable materials and surfaces other than the human body, bodily ornamentations belong to the evolutionary more archaic, contiguously

indexical forms of social communication, still in full use today, as the thriving cosmetics and fashion industries, as well as our self-consciousness about our external appearance indisputably testify. In all cultures clothes and fashion help people to negotiate their relations with the outside world, in addition to providing them with comfort and protection. As visual extensions of human bodies and personalities, clothes mirror people's intentions and desires, related primarily to sex and status. As Nancy Etcoff again suggests, the original purpose of female clothing for example may have been to draw attention to the erotic zones of the body rather than to hide them (Western sexual puritanism notwithstanding). This is why primitive art and body decoration tend to highlight the sources of fertility: clothing makes necks appear longer, breasts larger, shoulders wider, waists trimmer, hips curvier, feet smaller, and legs longer. Trends in (particularly female) fashion are continually changing, revealing and concealing in turns various erotic parts of the body, thus keeping sexual interest and social interactions alive and focused (Etcoff 1999: 222).

From memory to consciousness

Contiguous indexicality as exemplified by bodily adornments represents a more ancient form of social communication, mainly because reading contiguous cues, signals, and signs requires less advanced cognitive faculties than those needed to decipher signs referring to displaced originals: it is simply easier to establish a cognitive link between original and image when both are physically co-present, than when they are separated in time and space. On the other hand the ability to interpret an image that is removed from its original, as is the case with communication based on displaced indexes as well as on icons and symbols, involves making an extra cognitive effort to recall the semantic association linking the currently perceived sign with the absent original, and in most cases it also means learning that association in the first place. In other words, a large and important part of human communication is based on learned associations between culturally specific signs and their often equally specific meanings, which in most cases are displaced from the communicator and acquired through that paradigm of symbolic communication, the verbal language (see Chapter 10).

While animals communicate in a limited variety of contiguous situations (mating, danger warnings, territorial rivalry and so on), referential displacement inherent in the human language turns this form of communication into a most effective tool to exchange ideas about an almost unlimited variety of subjects and events from the present, past, future, including also the imaginary, nonexistent events. Still, ontogenetic learning facilitated by language in a significant measure

must build on and complement the innate responses which humans share with other mammalian species. In general, animals negotiate their environments using largely automatic reactions they were born with, aided by a limited number of learned, conditioned responses. On the other hand one of the features distinguishing humans from other animals is the extraordinary capacity of the former to learn many new things during their lifetime, and to store this knowledge in the mind for easy and quick access, whenever the need for a particular bit of acquired information arises. The cognitive faculty, largely absent in non-human animals, that makes this continuous learning possible, is *memory* – a prerequisite of such potent human cognitive attributes as the perception of the flow of time and the resulting ability to communicate about displaced objects and situations, without which human consciousness and culture would not be possible.

Animals too have memory, but it is rigidly programmed by the genes rather than by ontogenetic learning, and it is specialized rather than open, designed to optimize the demands of a species-specific task. For example, squirrels have evolved a capacious memory to keep track of the many places in which they cache their nuts, just as birds whose males sing to impress the females or to intimidate other males have genetically programmed capacious memory for songs (two hundred, in the case of the nightingale). By contrast human memory is not specialized but open and multifunctional. It is what psychologists call “episodic,” or “autobiographical” memory, employed mainly to keep track of one’s social transactions: who did what to whom, when, where, and why (Pinker 1998: 124; Coren, Ward and Enns 2004: 346; Schiffman 1996: 492). Human episodic memory is also continuous and sequential, carried over from one episode to the next, thus stimulating the cause-and-effect form of reasoning, absent for example in apes, whose memory is concrete, situation-bound, and related to immediate, short-term responses to current situations. Having no sense of the past and unable to anticipate the future, the apes, and even more so all the lower animals, live entirely in the present, from one discrete episode to another perceptively new discrete episode. This is why animals excel at accurate instinctive situational analysis and at prompt, optimal responses to the current events, but they cannot mentally re-present a situation to reflect on it, either individually or collectively. Even the new responses learned by Pavlovian-type conditioning do not become part of the animal’s memory in any conscious sense: these responses are only recalled, automatically and for a brief moment, when the stimulus that created the conditioned response in the first place reappears to prompt the same reaction (Donald 1991: 160; Bertalanffy 1981: 78).

Contiguity therefore reigns supreme for animals, and the lack of the sense of the flow of time is one of the reasons why chimpanzees, our nearest animal cousins, cannot be taught human language, that communication system specially designed to navigate mentally across the entire time spectrum. During the 1950s and

early 1960s psychological experiments were conducted to demonstrate whether humans learn language instinctively or because they are exposed to language they hear around them as they grow up. For the purpose of comparison, several families of American psychologists raised baby chimpanzees in their own homes alongside their own children. The effect was that chimps did learn to speak a few words of English, but on the whole the language-learning experiment proved to be a dismal failure for the chimps. One thing was that “speaking” really relied on whispering sounds that resembled the English words the chimps were imitating, but that could be blamed on their lack of the human-type vocal apparatus. More importantly, chimps will never be able to speak a human language because they lack the following interrelated cognitive faculties: combinatorial thinking necessary for grammar, a sense of time to anticipate the development of the communicative situation and to establish a sequence of causes and effects, and theory of mind to predict how the listener is going to understand and react to what the chimps “says” (Dunbar 2005: 117–119). Ever slaves to the here-and-now, chimps (and little human children for that matter) could only learn the individual words when the referents, such as food items, were functionally present. Typical messages of both chimpanzee and language-learning child consist therefore mostly of entreaties, demands, mollifications, declarations of ownership and indications of location. However, as human children grow beyond the age of three they can use language to report what has happened to them (which means that they develop a conscious sense of time); they can play and experiment with elements of language (due to combinatorial thinking); and they can introduce new, often imaginary topics (thanks to the faculty of meta-thinking). As experiments have shown, chimpanzees could accomplish none of the above things: all they could do was to string a number of words together in an emotive response to the current, most typically food related situation (Dissanayake 1991: 116).

Working memory, the ability to hold in conscious attention events that last in time, must have been acquired gradually in the course of human evolution, as both sides of the “eternal now” were being perceptually expanded to encompass more and more of the chronologically related events, both those that have just happened and those that were imaginatively anticipated to occur in the immediate future (Eichenbaum and Cohen 2001: 471; Sterelny 2006). According to Steven Mithen the Neanderthals, a species of *Homo* related to us and becoming extinct about 30,000 years ago, lacked this kind of working memory and their capacity to hold a variety of information in active attention was considerably lower than that of modern humans, which was one of the reasons, argues Mithen, why the Neanderthals did not manufacture material signs (Mithen 2005: 233, 251). It is possible to speculate that among the elements of the early hominids’ lifestyle that were stable enough over a sufficiently long time to selectively force an expansion of working

memory were the following: the domestication of fire, the production of tools, and group hunting – all of them processual activities that required planning, concentration, attention, and sustained multi-stage action to be accomplished.

As archaeological evidence indicates, the controlled use of fire dates back to late *Homo erectus* populations about 60,000 years ago, with some evidence of the opportunistic use of fire, obtained from a lightning bolt for instance, going as far back as one and a half million years (Dunbar 2005: 39). Sustained, controlled use of fire must therefore have been the common heritage of both the Neanderthals and the Cro-Magnon populations (*circa* 40,000 years ago), from which modern humans evolved. The use of fire is one of human universals, and its advantages include temperature control, illumination, protection from animals, cooking, purification, and aid in shaping tools (Brown 1991: 95). The psychologist Nicholas Humphrey also emphasizes the biggest if least tangible benefit of taming fire – the possibility to provide a focus for family and friends to gather round, to exchange gossip and useful knowledge, and to cement social bonds (Humphrey 2002: 182). The domestication of fire must have also played an important role in the psychological evolution of humanity, in that it required planning, including the choice of the site for the fire, the search and stocking up of fuel, as well as concentration and attention in igniting the fire and keeping it alive by adding more fuel at the right intervals. The processual, cause-effect nature of these activities both required and enhanced the expansion of working memory and the mental separation of the present from the future, while concentrated attention on a single, perceptually prominent spot (bright and hot), emotively associated with warmth, safety, and social intimacy, must in the long run have contributed towards the formation of specifically human consciousness, centred both on one's self and on one's immediate kin gathered round the fire. Derek Bickerton even says that the taming and handling of fire would not have been possible without a secondary representational system, corresponding with meta-thinking, necessary for the development of symbolic culture (Bickerton 1990: 141). A home base organized around the fire is another universal characteristic of the humans species, not only among the historically recent settled farmers, but even among the more ancient hunter-gatherers and nomadic pastoralists, who did not wander aimlessly but returned habitually to seasonal bases. Apes on the other hand roam constantly, sleep where night finds them, and then wander again to some other point in their habitual range. The earliest home bases have been attested for the *Homo erectus* (over a million years ago), who dwelled in caves and constructed temporary shelters where they kept fires, both for cooking and for protection from other species.

Expanded working memory, including processual thinking and anticipatory imagination, was also needed in effective tool production, impossible without the ability to visualize in a lump of rock a still-unformed shape and to anticipate what

its use must be, in the same way as the sculptor must first imagine the yet-unfinished form of the human figure he will create by chiselling away the unnecessary parts of a block of marble. The complexity of tool production should thus be a good index of the sophistication of neural circuitry underlying technical intelligence, a cognitive faculty rudimentarily present in the chimpanzees, which have been observed to strip leaves off sticks to use as probes for ants and to make fishing sticks for termites. In addition to catching insects, chimpanzees use small sticks for acquiring honey, removing nuts from their shells, and picking bits of brain from skulls. They also use leaves crushed together to form a sponge to gather up ants or water (Mithen 1999a: 74). However, the chimps' instrumental behaviour is still comparatively simple: a tool usually consists of a single component; it is manufactured from whatever material just happens to be lying around, without any apparent foresight or planning; and it remains entirely subordinate to the emotive, short-term, contiguous context of the nutritional need. Chimps cannot prepare a tool ahead of the situation in which it will be used, something that consciously anticipating humans do all the time. Nor does the manufacturing of simple tools constitute a part of the chimpanzees' "culture": once the tool is used and hunger is satisfied the tool is simply abandoned, not carried around or "remembered" to be later reproduced. Steven Mithen states unequivocally that we simply cannot attribute chimpanzees with specialized cognitive processes dedicated to the manipulation and transformation of physical objects, what he calls technical intelligence, so far found only in humans (Mithen 1999a: 76).

By comparison, the tools produced by *Homo habilis*, our ancestors from about two million years ago, already contain evidence of beginnings of processual thinking and expanding working memory. The so-called Oldowan artefacts (named after the site of Olduvai Gorge in East Africa) produced by *Homo habilis* include for example tools made to make other tools, such as the production of a stone flake to sharpen a stick. Such multi-step instrumental behaviour is unknown among chimpanzees, and it testifies to an early form of human-type cognitive fluidity, whereby the practical properties of two contrasting types of raw material, such as stone and wood, are understood, compared, and held in the mind as part of working memory (Mithen 1999a: 96). However, as Steven Mithen demonstrates, tool technology of early humans remained fairly conservative for hundreds of thousands of years, being largely limited to general-purpose hand axes, with the visible absence of tools containing multiple components, such as the hunting weapons produced by modern hunter-gatherers (the Inuit of Greenland for example). Still, the production of a typical symmetrical hand axe involved several stages, including the finding of the right raw material, careful planning to envisage the required symmetry of the tool, as well as manual skill, acquired through experience rather than based on instinctive motor behaviour, to detach flakes from a rough stone

nodule, sculptor-like, to achieve the desired, precise shape (Mithen 1999a: 118, 127, 131; Ingold 1993: 36; Gibson 1993c: 191).

Another important feature of the life of early humans that required and in turn reinforced long-term memory was group hunting, an activity that is impossible without advanced cognitive faculties such as detailed planning, sophistication of design of hunting tools and weapons, as well as patience and attention in manufacturing those tool and in stalking the big game. Some animals, such as large cats or the canidae, also practise group hunting, but it is their genetically determined way of life, as their canine teeth, fangs, claws, rapacious behaviour and meat-oriented digestive systems testify. By contrast, hunting is by no means a genetic necessity for the omnivorous humans, who have to consciously manufacture weapons and traps to make up for the absence of sharp canine teeth and claws. Still, group hunting must have been a persistent enough feature in the life of early humans to produce by natural selection certain innate behavioural predispositions, especially in males, such as those that motivate today's amateur hunters and anglers in their hobbies. Collective hunting also required a high level of co-operation and exchange of information about the natural world, best achieved through the speed and efficiency of symbolic verbal language which, as I shall discuss in Chapter 10, by definition involves capacious working memory to talk about spatio-temporally displaced objects and events. Modern hunter-gatherers (as well as amateur hunters and anglers) talk compulsively and with gusto about all the practical aspects of hunting: the tracks and trails of animals, the technical details of hunting equipment, weather conditions, features of hunting terrain, successes and failures of hunting expeditions, alternative hunting plans and so forth (Mithen 2005: 160, 166). As argued by the psychologists Gordon D. A. Brown and Nick Chater, foraging behaviour was the main ecological factor for the development of human timing ability, memory for temporal durations, and episodic memory. In addition to that, foraging behaviour appears responsible for human understanding of the links between psychological representations of memory, space and time (Brown and Chater 2001: 100; Martindale 1981).

In the end, ontogenetic memory (in contrast to the rigidity and automatism of phylogenetic memory) proved useful to humans, mainly because it enabled them to use the past to predict the immediate future, thereby to achieve greater adaptive flexibility during their lifetime rather than over an incomparably longer period of evolutionary adaptation. Memory is one of the cognitive faculties to make speculation about the future possible, and it probably evolved as a way of supporting effective decision-making related to forthcoming events. Because our decisions concerning the future require more information than is usually available in the environment at the moment of making a decision, additional information is provided by the relevant past facts and experiences stored in memory (Klein,

Cosmides, Tooby and Chance 2002). Although we do not literally experience exactly the same events over and over again, most events of the same type have enough similarities to previous ones for memory to put those who have it at a distinct advantage over those who do not (Workman and Reader 2004: 221). Robin Dunbar observes that one of the conspicuous features of our mental world is the way we rehearse what we are going to do, which involves considering alternative options, evaluating their likely outcomes, predicting cause-effect links and so on, something that other primates, living wholly in the contiguous presence, cannot do (Dunbar 2005: 65). Humans, by contrast, have what the neuroscientist John C. Eccles calls a “memory of the future,” or “remembered anticipations” – a memory not only of what has happened, but of the complex anticipations that we experience when we are thinking about future planned actions with all their possible consequences (Eccles 1989: 229). As a species, we also possess what in Chapter 3 I defined as the teleological need: we seem to be preoccupied with ends and goals; we organize our actions around imagined consequences they will produce; we struggle in vain to comprehend the implications of our inevitable termination of life; and we create marvellously elaborate and obscure stories to fulfil our need to find purpose and meaning in the fabric of this universe.

Memory is also a necessary condition for that uniquely human, complex, elusive and mysterious mental entity called consciousness, or awareness of one’s own existence (Thompson and Madigen 2005: v; Coren, Ward and Enns 2004: 420–424). All living systems exist objectively and care about what happens to them in the interest of survival. However, for plants and non-human animals the “caring” is done largely through instinctive, context-bound responses produced in the “eternal present” of contiguous interactions with the environment, without any subjective sense of the continuity of these interactions. Animals are mentally capable of doing many clever things, but for all we know they are not aware that they are doing these clever things. Similarly, human children are skilful “know-how-ers,” but not “know-that-ers” (Hauser 1998: 595). The absence of self-awareness in primates and small children is largely due to the lack of the subjective sense of the passage of time, and the resulting inability to appreciate the continuity of one’s mental processes and consequently of one’s existence. On the other hand in adult humans the extended working memory and the associated capacity to remember what has happened to one a minute, an hour, a day, weeks, months or years ago naturally generates a sense of continuity of subjective experience as the foundation of self-awareness, and of a feeling of one’s distinctiveness from other systems in the environment (not yet the Cartesian “I think, therefore I am,” which denotes a more advanced form of introspective consciousness, but something like “I experience, therefore I exist.”) (Eccles 1989: 201–204, 226). For instance, chimpanzees and gorillas are able to recognize themselves in the mirror, and appear to have a rudimentary concept

of self, but it seems that no chimp or gorilla *knows* that he is aware of himself (Mithen 1999: 93; Dissanayake 1991: 119). Consciousness can therefore be defined as a meta-cognitive ability of a system to be aware of its own subjectivity, and as far we know this ability is available only to humans. It is what the cognitive psychologist Robert L. Solso defines as “a state of attentional wakefulness in which one is immediately aware of his subjective sensations” (Solso 2003: 27).

The state of self-awareness is by no means obvious or inevitable in evolution, and indeed for Richard Dawkins the appearance of subjective consciousness is the most profound mystery facing modern biology (Dawkins 2006c: 59). On the other hand the physiologist Derek Denton sees consciousness as emerging gradually from animal primal emotions such as thirst, hunger, hunger for air, and pain, as a way of “constructing an integrated mental scene” to remember experiences related to these emotions in order to respond more flexibly to similar situations occurring in the future. This “primary consciousness,” observed in animals with certain brain structures similar to our own, would eventually give rise – according to Denton – to a “higher-order consciousness,” epitomized in humans, which involves a sense of self, the capacity of self-awareness, of an “inward turning of consciousness,” when the mind itself is both the subject and the object of cognition (Denton 2005: 5, 103). In a similar vein, Dawkins suggests that perhaps consciousness has arisen as a result of the brain’s representation of the world being complete enough to include a model of itself, a cognitive feat corresponding to what I earlier defined as meta-thinking, that is, not only thinking but also being aware of one’s thought processes (Dawkins 2006c: 59, 278). Thus understood self-awareness has the inevitable effect of liberating one’s mind from the world of concrete here-and-now experience, and of generating a quasi-autonomous virtual meta-experience in the meta-world – what is often referred to as spiritual culture or simply imagination. Without memory an organism is the slave to actuality: it only registers events when they take place. On the other hand consciousness facilitated by memory is able to monitor sensations, to entertain representations of sensations expressed through abstract entities such as numbers, as well as linguistic and visual symbols (Laszlo 1972a: 92). This is why psychologists strongly link working memory with consciousness, regarding the latter as a means of integrating and co-ordinating remembered perceptual data (visual, auditory, tactile and so on), as the basis of imaginative projections about the future (Baddeley 1993: 21; Schiffman 1996: 492). Thus understood consciousness would appear to confer important selective advantage: a species possessing it can plan actions, communicate the plan within a group, and carry it out in purposive teamwork. In this way consciousness can transcend the limitations of genetically programmed behaviour, allowing its possessor to learn from personal and group experience (Coren, Ward and Enns 2004: 346; Hoerl and McCormack 2001: 3; Laszlo 1972a: 95).

Conscious, subjective perception of the flow of time is therefore fundamental to the way humans perceive, think, act and represent the world. It permeates language, the main human system of social communication, and is the very foundation of culture conceived as conscious collective memory, separate from genetic memory. Every natural language in the world has separate verb tenses for past, present, and future, plus innumerable modifiers to specify time more precisely, such as “yesterday,” “today,” “recently,” “in an hour,” “while,” “during,” “after” and hundreds more. Cultural memory on the other hand constitutes a second (in addition to genetic) mode of inheritance, which evolved in humans as a way of adapting to a social environment that was changing faster than the natural, non-human environment, and required greater cognitive flexibility than that provided by purely instinctive, rigid, and stereotypical biological responses (Workman and Reader 2004: 368). In short, without extended working memory there is no perceptual connection between past, present, and future, no consciousness, no planning, no fully purposeful action, no culture, no technology, no art, no religion, no narrative or anything that defines us as human. None of these phenomena is also possible without memory-dependent social communication based on displaced referents: indexical, iconic, and symbolic, that constitutes much of human cultural behaviour. In the words of the biologists Peter B. and Jean S. Medawar,

human behaviour can be genuinely purposive because only human beings guide their behaviour by a knowledge of what happened before they were born and a preconception of what may happen after they are dead: thus only human beings find their way by a light that illuminates more than the patch of ground they stand on (Medawar and Medawar 1977: 171).

Memory and the beginnings of culture

It may be unfashionable in academic circles to speak of evolutionary progress, but as Edward O. Wilson comments in relation to the development of life, rather than remaining static or regressing nature has in fact managed to produce through time organisms of increasingly complex structure (Wilson 1998: 107). Richard Dawkins’ answer to the question of progress in evolution is also a limited “yes,” especially in relation to human evolution, which happens to involve primarily the nervous system, that is, the brain (Dawkins 2003: 119, 248, 251). Ervin Laszlo too observes that we only need to consider the contrast between the simple single-celled organisms and warm-blooded creatures such as mammals to see that the direction of evolution is from simple to complex, rather than the other way round (Laszlo 1972a: 58). It does not mean, however, that complexity of structure or function is the predestined goal of evolution; rather, it is the result of it. Despite the compulsions

of human teleological need, as expressed in religious and philosophic ideas, to impose ultimate, transcendental purpose on the history of the universe, objectively speaking there seems to be no preset goal in the development of living systems. Rather, we can talk about the process of evolutionary transformations of organisms in interactions with one another and with the environment, leading towards gradually more effective adaptations (Dawkins 2006b: 178, 181). Subject neither to some transcendental purpose nor to pure chance, evolution does nonetheless reveal one great constancy: a tendency to favour increments in structural complexity, especially of the nervous system, to bestow an ever-increasing representational power on some organisms. Anything that gives a creature a fuller view of its environment will enable it to survive perils that would otherwise be fatal, and creatures whose representational systems (i.e. brains) are even fractionally more sophisticated than those of their conspecifics will tend to outbreed them, and over lengthy periods of time the genes carrying such adaptations will spread through the population (Bickerton 1990: 103).

Applied to the evolution of human communication systems the above general observation probably means that while there was nothing inevitable about the transition from contiguous and indexically contiguous communication to communication based on displaced referents, the latter simply proved more effective by bestowing greater adaptive flexibility and ecological success on the *Homo sapiens* when compared with the early hominids, to say nothing of all other animals. It is very probable that the Neanderthals became extinct precisely because they could not compete for resources with modern humans possessing superior hunting abilities aided by complex tools and more effective, symbolic systems of communication based on displaced referents, notably syntactic language. As far as we know, the Neanderthals painted their bodies, that is, they availed of contiguously indexical communication, but they had no language and used no symbols: that is, they had no ability to engage in communication based on displaced referents, and consequently had no related cognitive abilities such as extended working memory and consciousness (Mithen 2005: 223, 263). At the same time social communication based on indexes, icons, and symbols did not descend on humanity suddenly, in the form of predestined, god-sent inspiration, like the black monolith from Stanley Kubrick's film *2001: The Space Odyssey*. Rather, it arose gradually through natural selection from the complex brain circuitry of our ancestors as a more effective cognitive tool for exchanging useful information, for the purpose of outdoing the rivals such as the Neanderthals in competition for vital ecological resources.

One of the earliest consequences of the ability to establish imaginatively causal links between temporally displaced objects, in other words of memory, are complex tools, whose production is impossible without processual, cause-effect type of thinking that comes with memory. All tools and other human artefacts such as

weapons, hunting traps, other contraptions, devices, and machines, also clothes, jewellery, built shelters and other architectural structures, musical instruments, works of art and so on – in fact everything that archaeologists call material culture, are indexes of human conscious, creative thoughts and actions, just as ant hills, the birds' nests, the spiders' webs, the beavers' dams and so on are indexes of the animals' instinctive, rigid and specialized behaviour. According to the definition of index adopted in Chapter 2, any direct physical change produced by a system in the environment forms an index of that system, an indirect evidence of the system's existence and behaviour. The change can assume the form of unintentional and inadvertent cues, as in leaving footprints or excrements, or in the form of intentional signals, instinctive in the case of animals, and both instinctive and volitional in the case of humans. For example, for most mammals urinating is a physiological reaction to remove liquid metabolic waste, but for some species it can be both that and a way of scent-marking the territory, as happens among male dogs, in which case the same reaction constitutes not only a physiological cue but also a social signal. Female or young dogs urinate without lifting their legs, directly on the ground, whereas a mature male dog lifts its leg and urinates on a post or tree, at a nose height just right for other dogs to detect. In other words, in the latter case urinating is not only a manifestation of renal physiology, but also an act of communicating (Plotkin 1994: 104). Unlike an inadvertent cue, signal is designed (by evolution) to be manipulative, that is, to influence the behaviour of others by communicating a message, in the above example something like "keep away, this is my territory, and if you trespass, you'll have to reckon with me." Of course, no such line of reasoning goes through the brain of a male dog marking its territory in this way: the animal simply performs a genetically programmed reaction without realizing what it is doing, still less why.

In the case of meta-thinking humans, however, we are dealing with behaviours that can be interpreted both as cues or signals and also as signs of potentially symbolic significance. Chronologically speaking, the earliest human indexical signs, that is, consciously produced artefacts other than symptomatic behaviours such as facial expressions, body language, and emotive vocalizations, are bodily adornments (contiguous indexes) discussed earlier, as well as tools and weapons (displaced indexes) made from some durable material such as stone, bone, or wood. These artefacts not only required the human-type extended ontogenetic memory and cause-effect thinking, but they also encouraged and reinforced these cognitive faculties in return, by serving as what Henry Plotkin calls "exosomatic information storing devices," as exemplified today by works of art, books, microfilms, magnetic tapes, CDs, DVDs, and other digital storage devices (Plotkin 1994: 254). Early in human history a woman painting her body with red ochre (a contiguous index) relied on the memory of the attention paid by males to

menstruating women, and conversely, a female body painted in red would make males remember the connection between the colour red on the woman's body and her possible fertility even more. In the same way the multi-stage production of a tool required the memory and anticipation of the tool's purpose, just as the finished tool constituted a reminder, a mnemonic device, of the reason and purpose for which the tool was originally manufactured.

Working memory was thus necessary as a psychological precondition to produce both contiguous and displaced indexes, but it also had to be aided by the very artefacts it helped to produce, because – as we all know only too well – human memory is an imperfect cognitive tool. Our minds are certainly not like computers in this respect, because unlike computers we tend to forget many of the things we once memorized. For instance, we forget important appointments, we have selective and distorted recollections of the past, we often suppress the memory of embarrassing or shameful events, we are often seemingly unable to remember the name of a familiar person and so on. If memory is the product of evolution that gives humans an adaptive edge over animals relying solely on automatic, instinctive or conditioned responses, why does it apparently fail us so often? The psychologist Daniel Schacter proposes an adaptive explanation of why human memory is fallible, by listing what he calls “the seven sins of memory.” These include *transience*, that is, the gradual weakening or loss of memory over time, as in not being able to remember in detail what we did years ago; *absent-mindedness*, that is, a breakdown at the interface between attention and memory, as in forgetting where we left our keys; *blocking*, that is, failing to retrieve information that we know we know, as in being unable to remember the name of a familiar person; *misattribution*, that is, forgetting the source of information, as in claiming as our own an experience we read about in a book or saw in a film; *suggestibility*, that is, distorting or exaggerating what happened under the influence of leading questions or comments; *bias*, that is, unconsciously editing the past, to present ourselves in a more positive light for example; and *persistence*, that is, repeatedly recalling disturbing or unpleasant events, as in reliving a car crash or some embarrassing incident. Thus according to Schacter transience is adaptive because not all experiences and information remembered at any given time will have future benefit; absent-mindedness is adaptive because we cannot attend to everything at once; blocking is adaptive because the things we tend to forget are low in frequency or ones we have not used for some time; misattribution is also adaptive because often what is remembered is more important than where the particular information came from; suggestibility is adaptive because exaggerating the events of the past under the influence of leading questions makes us look more confident and reliable before the interlocutor; bias is adaptive because it presents us in a more positive light; and persistence is adaptive because by making negative events prominent memory is

warning us not to make the same mistakes again (Schacter 2001; Workman and Reader 2004: 226–229).

It is precisely because our memory is fallible and imperfect that we need the exosomatic information storing devices. If human memory was like that of a computer, always complete, accurate, and quick on recall, we would not need mnemonic devices such as folk stories, works of art, social ritual, writing, photography, film, sound recordings and other electronic data bases prompting culturally relevant information in our minds. Anything once thought, imagined, seen or heard would be remembered faithfully for ever to be recalled accurately and in its entirety at any time, and we would not need any external cues or prompts to remind us of anything. The earliest works of art – the Upper Palaeolithic cave paintings and sculpture – are thus indirect evidence both of the presence and of the imperfection of human memory. On the other hand, the fact that other primate species such as the Neanderthals did not produce durable exosomatic information storing devices indicates that they had no working memory at their disposal, and that they did not need pictures, rituals or folk tales because there was nothing in the Neanderthal mind to be prompted or retrieved by these artefacts.

The primary purpose of prehistoric realistic art was therefore to store useful information about the part of the natural world that the early humans needed to remember: knowledge about animals either used as prey or feared as predators. The cave images and portable sculptures facilitated the recall of those important elements of the natural environment by serving as mnemonic devices to identify the species and to communicate useful knowledge about animal behaviour (Mithen 1999a: 170, 172). In fact, the purpose of any durable sign is to reinforce individual and social memory, as culturally acquired knowledge of the natural and social environments was expanding beyond what any individual, equipped with imperfect and fallible memory, could consciously embrace. The durable signs would include first of all material, visual artefacts, such as bodily adornments, tools, weapons, sculpted pieces of wood or bone, as well as rock carvings and paintings, which were probably supplemented by auditory signs such as speech or song, durable due to their repeatability despite the natural volatility of the auditory medium. Even before the Upper Palaeolithic portable sculptures, cave paintings, and rock carvings, which mark the recorded beginnings of iconic culture, the continuity of cultural memory must have been maintained by such visual signs as contiguous indexical bodily decorations, especially the permanent ones such as tattooing and scarifications. Impermanent bodily adornments such as makeup, clothes or jewels are by comparison more transient, subject to change together with a person's social role, or even due to something as unpredictable and capricious as one's personal whim or fashion, which seem to change without any apparent accompanying shifts in cultural values, but just for the sake of changing.

On the other hand permanent bodily decorations and modifications found in tribal societies, including circumcision for boys, clitoridectomy for girls, scarifications, tattoos, body piercing, branding, hair removal, cranial binding, feet binding and so on, are constant and fixed reminders of one's ethnic and tribal affiliation, social status and gender role (Ebin 1979: 25). As the ethnographer David Lewis-Williams puts it, the surface of the body can become the stage upon which the drama of socialization is indexically enacted, in which body adornment becomes the language through which it is expressed (Lewis-Williams 2004: 90). In all cultures social identity changes through individual life: people move from adolescence to adulthood, from unmarried to married, from child-bearing to past-child-bearing, from unrelated to related-by-marriage status. Body adornments are sensitive to these changes, and in many cultures people change them to signal their social role-of-the-moment. Body decorations and alterations thus represent removable and irremovable, respectively, contiguous indexes that determine, either temporally or permanently, a person's membership in a group and his or her position in it. For example, different tribes of the American Indians of the Northwest Coast used to distinguish themselves from other tribes by deforming their skulls in very specific and purposeful ways. Among the Kwakiutl, the Salish, and the Nootka, whose members were designated as "Flat-Heads" by early white explorers, shortly after a child's birth the mother would bind a board against its forehead at an angle which produced the sloping head peculiar to her own people. Slight variations of the technique would result in different head shapes which served to distinguish one people from another at a glance. As a literally unchangeable marker of ethnic membership, the sloping head as a contiguous indexical sign also carried for the Indians additional, aesthetic meta-meaning, as a high-domed forehead was considered to be a feature of great beauty by its practitioners (Ebin 1979: 35).

In other cultures permanent bodily decorations and modifications would not only serve as constant reminders of tribal identity, but would also distinguish different classes of people within the tribe. Circumcision, scarring, or tattooing were usually applied during puberty initiation rites to mark a young person's progress from the position of a child to that of an adult, a status that carried with it its appertaining rights, privileges, and duties. In such cases bodily signs change together with the person's social status, providing a permanent, portable record of one's personal history on constant display to fellow tribesmen, to remind everyone of the wearer's life experience to date, as well as of his or her current social role. The Marquesas Islanders, for instance, used to tattoo their bodies gradually, adding new tattoos to different parts of the body during a series of initiation rites performed between birth and old age, at which time the body would be completely covered in tattoos. Thus different patterns of tattoos or permanent scars would

distinguish unmarried girls from married women, pubescent boys from adult warriors and so on (Ebin 1979: 47, 53, 56).

Of course the body in its natural state also produces inadvertent visual cues indicating a person's sex, age, physical attractiveness and fitness. However, in human cultures these outward cues of physiological development are not sufficient, and have to be accompanied and enhanced by consciously produced contiguous indexical signs in the form of both permanent and changeable bodily decorations, to provide more detailed information about one's status in a society whose structure is much more complex than anything found even among the most social of animals. The universality of human preoccupation with cultural modifications of the body and with external appearance appears to be due to the working of an innate cognitive module, originally developed as part of primate social instinct, to read bodily and facial cues and signals for relevant emotions and intentions in direct, contiguous communication (Etkoff 1999: 36; Gibson 1993b: 11; Mithen 2005: 155; Lambert 2004; Ingold 1993: 35; Kendon 1993: 48–53). In today's Western societies, with their social mobility and legal equality of everyone, bodily modifications are no longer rigid markers of one's social duties and privileges but more of a lifestyle choice, a free expression of individual personality rather than of collective values or an indication of one's status. Thus teenagers tattoo and pierce their bodies and wear eccentric clothes as an expression of their angst and peaceful rebellion against conventional, adult values; people diet and exercise to keep their bodies in shape mainly for private health reasons; plastic surgery is becoming more and more fashionable to gratify people's personal vanity rather than to indicate their social status; and most of us attend daily to our personal hygiene and wear clean, neat clothes more because these things make us feel comfortable than to prove our membership in "civilized" society.

Material culture as index

Apart from contiguous indexical signs worn by people directly on their bodies, which in traditional cultures provide a record of their individual personal histories, the displaced indexes that constitute material culture serve, in addition to their direct utilitarian purpose, as mnemonic devices coding their producers' different ethnic histories. All societies at a comparative level of social and technological development use similar tools which, however, always differ slightly in the manner of their production, in raw materials, variations of shape, ornamentation and so on. Some of these differences may be due to radically different conditions of the groups' living environments, so that, for instance, the aboriginal hunters of Australia and the native Eskimo will use widely differing hunting tools, despite other similarities

in the basically hunting-gathering ways of life of the two groups. But even within the same type of environment neighbouring groups can develop distinct and unique styles in the manufacturing of the same types of tools, which henceforth become indexes, incidental or deliberate, of group affiliation. Members of one group will recognize as their own the particular manufacturing style, shape, and ornament in tools, weapons, clothes, shelters and so on, and will emphasize their group solidarity by “patriotically” holding on to these artefacts rather than borrowing foreign ones. At the same time alien or unfamiliar styles, usually attributed to neighbouring or rival groups, will be treated with curiosity mixed with distrust, or conversely, with admiration. In addition to their immediate practical purpose therefore, utilitarian material artefacts inadvertently function as cultural memory aids, reminding their users of who belongs to the group and who does not.

In this way material artefacts support cultural memory and consolidate group identity, which explains every group’s respect for its own artefacts, frequent distrust of other groups’ material culture, as well as occasional acts of deliberate destruction of the material achievements of rival groups as a way of undermining their cultural identity. History of human conflict not only abounds in wholesale slaughters and massacres of populations, but also in systematic, deliberate destructions of the enemy’s material heritage, to make sure that “not a stone upon a stone” is left of the enemy’s dwellings, temples, works of art and infrastructure. The image of the once powerful ancient city state of Carthage springs to mind, razed by the Romans in 146 BCE, its population sold into slavery, the site ploughed, and salt poured into the furrows so that nothing would ever grow there (Davies 1997: 155). In modern times a similar attempt to wipe out a country’s capital from the face of the earth, as if it had never existed, was Adolf Hitler’s revengeful decision to destroy west-bank Warsaw following the fall of the city’s uprising against the German occupation in September 1944. The demolition of the city proceeded methodically for more than three months, while its population was sent as slave-labourers to Germany (Davies 2003: 437). Unlike Carthage, however, Warsaw was rebuilt from scratch after the war, much of it in its original shape, in a heroic attempt to restore Polish national identity and to maintain cultural continuity. The respect and nostalgia for historical monuments is not mere sentimentality or political propaganda therefore; it serves an important adaptive purpose for the group by consolidating its identity as distinct from that of other groups. The destruction of material artefacts serving as indexes of culture and as collective memory aids can effectively cripple any attempts by survivors to restore the ruined culture. Civilizations die both because people as individual carriers of cultural memory die or become dispersed, and because of the destruction of the material artefacts as indexes and as memory aids sustaining the culture’s identity.

This is why all societies value their material heritage: architecture, works of art, tools, written documents – in fact any material remains that establish a temporally displaced contiguous and indexical link with the past, that is, with the society's history. It is the contiguous character of objects such as architectural ruins, original works of art and historical documents that defines their emotive and nostalgic value, as compared for example with replicas, copies, or reconstructions of the same artefacts. In semiotic terms, replicas are contemporary icons of temporally displaced contiguous or indexical signs, and their psychological effect is less powerful than that of contiguous signs because, unlike indexes, iconic signs are not physically caused by originals. Historic ruins (metonymic contiguous signs) are for this reason rightly perceived as more authentic and "truthful" in relation to their originals, even if they no longer resemble the originals they were once part of. On the other hand copies, replicas or reconstructions (icons) may look like their originals, but they are rightly perceived as less authentic and less "truthful" than the ruins, because they have no physical connection with their originals. The historic Old Town in Warsaw, almost completely destroyed by the Germans during the last war, was rebuilt after the war as an icon of what it once was, losing its contiguous and indexical authenticity in the process (except for a few surviving parts of the old walls incorporated in the new buildings). On the other hand, the ruins of the Roman Forum are left as ruins, and no decision has been taken to reconstruct Rome's ancient quarter to make it look the way it did two thousand years ago. The present site in no way resembles the ancient city of Rome, but at least the ruins are real. By the same token Leonardo Da Vinci's badly preserved famous wall painting of the Last Supper from the church of Santa Maria delle Grazie in Milan is left as it is, that is, badly preserved, with conservation limited to prevent further deterioration of the painting. Leonardo's painting today may be a far cry from its original appearance, but the spatially contiguous character of what remains is probably rightly considered more valuable than any possible iconic reconstruction of its original shape, however faithful. Semiotically speaking, the remains of the original paint on Leonardo's picture form a spatially contiguous metonymic sign of the original work, as well as an index of Leonardo himself. On the other hand a repainted picture, despite its possible greater visual resemblance to the original, would constitute an iconic sign, in other words a copy, without any direct, causal link either with the original painting or with Leonardo himself.

Photography, or the magic of iconic indexicality

As I discussed earlier, contiguous communication is the necessary condition for all other, cognitively more complex forms of indirect communication, involving indexes, icons, and symbols with their spatio-temporally displaced originals. After all an index, an icon or a symbol, regardless of their actual meanings, must first be directly perceived in the contiguous context before they are interpreted and possibly responded to. Moreover, any man-made sign, whether iconic or symbolic, is first of all an index, an automatic material record and reflection of human consciousness and purposeful behaviour: a tool, a talisman, a work of art, a building, a spoken utterance or written text, initially contiguous with the person who originated it and later displaced, either spatially or temporally or both, but still retaining that “magical” link with its creator by virtue of being once contiguous with him. Indexicality is indeed closely connected with contiguity, evidently so at its origin, which is why displaced indexical signs are often psychologically endowed with all the emotive responses normally due to direct, contiguous signs.

When indexicality is mistaken for contiguity

From an evolutionary point of view responses provoked by contiguous signs are largely governed by innate cognitive modules shaped by natural selection, for which reason they tend to be emotionally charged, often beyond conscious control, and what we sometimes describe as “irrational.” But while instinctive, emotive reactions to contiguous events, because of the latter’s direct effect upon our survival and fitness, are understandable and “normal,” similar reactions extended towards displaced indexical signs, simply because they were once physically associated with significant objects, persons, or events, can raise a few eye-brows among the more cool-headed, so-called rational people. Unreasonable and illogical as it may appear, mistaking displaced indexes for contiguous signs is a universal tendency of the human mind, which lies at the root of magical thinking, at least of one type of it, identified by the anthropologist James George Frazer as *contagious magic* (Frazer 2002: 11; Mauss 1972: 64). This widespread way of thinking and acting follows,

according to Frazer, the psychological law of contact or contagion, based on the assumption that things that once have been in contact with each other remain always in contact, even when physically separated. Thus a sympathetic, “magical” link is believed to exist between a person and any severed part of that person (a simultaneous metonymic sign) such as hair, nails, teeth, the navel-string or the placenta. Whoever gets into possession of those once fully contiguous objects will be able – so the thinking goes – to exert an influence, from a distance, upon the original owner of these objects. Among numerous examples Frazer mentions midwives in nineteenth-century Germany, who would deliver a dried navel-string to the father of a new-born child, with an injunction to preserve it carefully, for as long as it was kept the child would live, prosper, and be free from sickness (Frazer 2002: 40). The use of nails or hair in black, harmful magic is part of popular folklore, even in modern industrial societies, and does not require further exemplification. Irrational reactions to spatially and temporally displaced metonymic signs underlie the cult of relics as well as the fascination with fetishes and memorabilia, in religious and secular contexts alike. Whether it be a saint’s bone, a child’s lock of hair, John Lennon’s glasses, or a rosary blessed by the Pope, the very fact that certain objects were once in direct contact with significant public personages or people dear to us endows these objects with compellingly emotional, indeed “magical” quality, to which we often succumb against our more rational judgment.

Interestingly, within the magical mindset charms, both malevolent and benevolent, can be worked on a person not only through displaced metonymic signs but also through displaced indexes, such as impressions left by the body in the ground for example. In his monumental study of magic and religion Frazer quotes it as a world-wide superstition that by injuring footprints one could also injure the feet that made them. For example, the natives of south-eastern Australia believed that they could harm a man by placing sharp pieces of quartz, glass, bone, or charcoal in his footprints. As an instance of benevolent magic based on the same principle Frazer mentions a custom practised among southern Slavs, whereby a girl would dig up the earth from the footprints of the man she loved, and put it in a flower-pot. She would then plant in the pot a marigold, a flower believed never to fade, and as its golden blossom grew and bloomed, so should her sweetheart’s love grow and blossom, never to fade. According to a similar line of thinking, the aborigines of Victoria would put hot ambers in the tracks of the animals they were pursuing. Hottentot hunters would also throw into the air a handful of sand taken from the footprints of the game, believing that this would bring the animal down. Ewe hunters of West Africa would stab the footprints of game with a sharp-pointed stick in order to maim the quarry (Frazer 2002: 44).

The rationalistic and condescending Frazer could write a hundred years ago that contagious magic was typical for “the crude intelligence not only of the savage,

but of ignorant and dull-witted people everywhere” (Frazer 2002: 12). No matter how empirically mistaken magical thinking can be, the universality and persistence of contagious magic in traditional cultures, as well as similar reactions in otherwise educated people in secularized Western societies, strongly suggest the working of innate cognitive modules, originally developed to cope with contiguous situations always affecting one directly in a way impossible to ignore without potentially putting oneself in danger or missing some existentially important opportunity. What happens in contagious magic is that a person acts towards a temporally displaced metonymic sign or index as if it was a fully contiguous sign. In other words, one acts as if time did not exist, or rather as if one wished it did not exist. This way of thinking would appear to be an echo of the archaic, early human mindset, geared primarily towards registering and reacting only to physically co-present events, as the ones most likely to affect one’s survival. In this archaic frame of mind one still subjectively exists in the “eternal present,” unable to differentiate perceptually between a current event and an event that is past. If the effects of time are ignored, then elements that once formed an inseparable whole, such as a person and his or her hair, nails, or personal objects, can still constitute a “whole” for a subjective observer, even if the elements have become separated with time. Thus understood magical thinking, based on our inability or reluctance to accept the working of time, should for evolutionary reasons constitute our default cognitive state, which has to be overridden by a conscious effort to learn the objective, that is, actual cause-effect temporal links between objects and events in the world, and to disbelieve the often psychologically compelling but objectively false connections.

In this sense even for the most self-aware, rational, and scientifically educated people there is no escape from at least some residues of contagious magic, as is testified by our often obsessive emotional attachment to, or at least interest in, mementos, keepsakes, souvenirs, family photographs, gifts from people once dear to us, various “secular” talismans, fetishes and so on – objects imbued with nostalgia and sentimentality springing from our unconscious refusal to accept the destructive progress of time, in a naïve wish to stop its ravages and to live again, against our better judgment, in the eternal present.

Indexical and iconic “magic”

Photography, a very recent technological invention, offers a good example of a quasi-magical way of thinking that characterizes our supposedly modern and rational minds. The emotive effect produced even by a poor-quality photograph of a person is in some respects incomparably greater than that produced by a well-painted portrait, and that has everything to do with the difference between the

indexicality of photography and the iconicity of painting. As a representational visual medium photography should be discussed more appropriately in the context of the history of iconic signs, especially of realistic painting which photography effectively ended in the late nineteenth century. However, it is important in the present context to emphasize the primarily indexical character of photography, and by extension of film and television, which accounts for the truly “magical,” psychologically archaic quality of these otherwise modern and highly technological forms of social communication.

As discussed in Chapter 4, the appearance of expanded working memory in humans brought on not only a general perception of the cause-effect relations between events occurring in the world, but also a more specific realization of the negative consequences of time such as the ageing and dying of living organisms, by extension including oneself and one’s relatives, that is, people sharing one’s genes. Since ageing and dying, unavoidable as they are, in an obvious way reduce one’s fitness and are thus counter-adaptive, the realization of these depressing phenomena must always have been associated with negative emotions such as sadness, grief, helplessness and so on. These emotions could be alleviated up to a point by self-deceptive attempts to “arrest” the destructive consequences of time, for instance by “immortalizing” the visible world (as well as the invisible, supernatural one, according to one’s beliefs) in permanent images, carved or painted, with an underlying desire to establish some illusory control over the otherwise uncontrollable changes brought on by time. The sentiment expressed in the Latin aphorism *ars longa, vita brevis*, originally attributed to the ancient Greek physician Hippocrates, may in fact have been experienced dozens of thousands of years earlier by prehistoric sculptors and painters, who wanted to fix in permanent images the fleeting world around them. Symbolic language too probably played some role in imposing this self-deceptive control over time, for example by means of stories recounting the mythical, cyclical history of the universe and of the group, based on the birth-death-rebirth pattern, narrated at regular intervals as determined by the group’s ritual calendar. However, in the absence of any linguistic records from the early history of humanity, we have to rely on preserved permanent iconic images, such as those found in the Upper Palaeolithic portable sculpture and cave paintings from over 30,000 years ago (see Chapter 7).

It is possible therefore to speculate that the earliest iconic images served a double magical (in the sense of self-deceptive) purpose: to arrest the destructive working of time by “freezing” an object in a specific moment on an iconic image, and to control the object represented by the image. However, due to their manner of production icons reflect not so much the outside world as human perceptions and beliefs about that world. As can be recalled, an icon is an image related to original through correspondence of information, in other words, through

perceptual resemblance, rather than through any direct physical link between the two as is the case with indexes. This is because unlike index an icon is produced by the receiver (here: humans), and not by the sender (here: external object). In this sense a silhouette of a bison painted on the wall of Lascaux cave only resembles the real bison in its shape, but otherwise possesses no physical connection with the animal in question. Any beliefs in the efficacy of sympathetic magic based on external similarity between original and image must therefore have been limited in comparison with the alleged magical power of an image that was somehow directly connected with original, as is the case with contiguous metonymic and indexical signs. Icons can thus be expected to possess less “magic” than metonymic signs or indexes, and should accordingly exert less powerful emotive influence.

In view of the above, the main reason for the extraordinary psychological power of photography lies in the fact that it combines – uniquely in the history of human visual representations of the world – the effects of both iconicity and indexicality. A photograph is, in this sense, an *iconic index*, as are its derivatives such as film and television. It is first of all indexicality that makes these forms of visual representation so much more efficacious in reflecting the outside world, and so much more powerful in their emotive effect on viewers than purely iconic representations such as painting, drawing, or sculpting. The iconic indexicality of photography means that its images not only resemble the photographed objects (with resemblance much closer and more realistic than that produced by even the best paintings), but that the photographic images are also physically related to the objects they represent in a way never attained by painting. This is why the art critic Jonathan Friday refers to photography as a distinctive mode of signification, “straddling the categories of icon and index,” in that it represents the world so as to give us something akin to perceptual experience of what it depicts (Friday 2002: 49). Another term used by critics to refer to the indexicality of photography is “transparency”: this is because, as the philosophers of art Noël Carroll and Kendall L. Walton explain, we see *through* photographs to the objects, persons and events that give rise to them. Paintings on the other hand are not dependent on the visible properties of the objects which they represent, but are dependent instead on the painters’ beliefs about these objects (Carroll, Noël 1995: 70; Walton 1997: 68). The idea that photographs have a physical connection with what they represent, and that they differ fundamentally in this respect from drawings, sketches, and paintings, which are humanely mediated, and that because of this photographs somehow put us in closer contact with the world than do “hand-made” pictures, has been a constantly recurring theme in theoretical and aesthetic discussions of photography (Walton 1997: 67; Bazin 1980; Sontag 1978; Marien 2006; Trachtenberg 1980). Even in painting from life, the painted scene reflects only the painter’s beliefs of what is there, whereas a scene in front of the camera is

not affected by the photographer's beliefs. Kendall L. Walton puts it simply and succinctly: "The painter paints what he thinks he sees. The photographer captures with his camera whatever is in front of it, regardless of what he thinks is there" (Walton 1997: 68). In other words, photographs depict realities that already exist (although of course only the photographer's choice can disclose them), whereas paintings create physically non-existent realities.

It is thus the combined emotive power of indexicality and iconicity that accounts for a truly "magical," compelling and deeply touching effect of photographs, both at the moment of taking the picture and later when contemplating it. It is ironic, as the writer Susan Sontag has observed, that at the point of history when secularism became almost entirely triumphant in the Western world, photography should revive, in wholly secular terms, something like the primitive status of images, an irrepressible feeling that the photographic process has something magical about it. No one takes an easel painting, merely an iconic image, to be in any sense co-substantial, that is, indexical, with its subject, because it only represents or refers. On the other hand a photograph is not only like its subject, but by virtue of being an index of its subject it is also indirectly a part of it. In an instinctive psychological sense therefore a photograph is a potent, if illusory, means of acquiring the subject and of gaining control over it (Sontag 1978: 155). The indexical nature of a photograph creates a subjective impression of a surrogate possession of a cherished person or thing, a possession based on an implicit assumption of identity, on an inseparable sympathy between a photograph and what it represents. Susan Sontag describes vividly this uncanny, magical effect:

The lover's photograph hidden in a married woman's wallet, the poster photograph of a rock star tacked up over an adolescent's bed, the campaign-button image of a politician's face pinned on a voter's coat, the snapshots of a cabdriver's children clipped to the visor – all such talismanic uses of photographs express a feeling both sentimental and implicitly magical: they are attempts to contact or lay claim to another reality (Sontag 1978: 16).

Considering both the compelling psychological effects of photographs and our innate sensitivity both to iconic images and to indexes of important objects, such as fellow humans for example, it is curious that it should take humanity so long to produce displaced iconic indexes, which is what photographs are in semiotic terms. The reasons for this delay were mainly practical – photography is a highly technical medium – and the right conditions for it were only created as a consequence of a number of discoveries and inventions in physics and chemistry made during the scientific and industrial revolutions in Europe and America in the last few centuries.

Brief history of iconic indexicality

If photography is to be defined in terms of displaced iconic indexicality, then the first “photographs” on record are imprints of human hands with outstretched fingers, found among the paintings on the wall of the Chauvet cave from over 30,000 years ago. In Chauvet a hand was placed flat on the cave’s wall, and paint was then applied around it and between the fingers (Chauvet and Deschamps 1996: 79). Such negatives of human hands are also found in other Upper Palaeolithic caves in southern France and northern Spain, as are the positives: impressions of hands coated with pigment and pressed against the wall. In one Spanish cave, the Gargas, there are nearly a hundred and fifty red and black hands, some of them small, probably belonging to women or children (Leroi-Gourhan 1968: 148). These “signatures” are the first recorded permanent and intentional iconic indexes: iconic in the sense that the impressions of the hands bear a close resemblance to the hands that made the impression, and indexical in the sense that the impressions were actually physically caused by the hands of living people, who evidently wanted to preserve a bit of themselves for posterity, not unlike those modern tourists who cannot resist inscribing or carving their names, with dates, on the walls of famous buildings they visit.

The dream to be able to fix an iconic index of a person, in other words to preserve the appearance of that person after the person’s death, in defiance of time, is also reflected in the widespread myth of the Otherworld, where the souls of the dead people continue their existence. In the absence of family photo-albums or home videos containing temporally displaced iconic indexes of dear persons, the ancient Greeks invented Hades populated by living “shadows” of dead people. In semiotic terms a shadow is a contiguous index, physically caused by an object obstructing the light rays, thereby possessing a direct connection with that object. The shadow of a person meets that person’s feet on the ground, and when the ground is even and the rays of the sun fall at an angle of about forty-five degrees, the shadow will produce an undistorted image of its master. The duplication of an object by another object that is tied to it and imitates its motions and at the same time is curiously transparent and immaterial has always caused fascination. Throughout the world the shadow is considered an outgrowth of an object that casts it. The second, filmy self of a person for example is believed to be identical with or related to the person’s soul or vital power. To step on a person’s shadow is a serious offence in some cultures, and a man can be “murdered” by having his shadow pierced with a knife. At a funeral, care must be taken to avoid having a living person’s shadow caught by the lid of the coffin and thus buried with the corpse (Arnheim 1974: 317). Fully contiguous with a person during his lifetime, the immaterial “soul” can survive its carrier to dwell for ever in the land of shadows,

which is how Homer describes Hades, visited by Odysseus anxious to embrace the shadowy and elusive figure of his dead mother (Homer 1980: 115).

In early modern times a direct precursor of displaced iconic indexes of photography were the fully contiguous iconic indexes produced by the camera obscura, an optical device and a drawing aid used by realistic painters of the seventeenth- and eighteenth-centuries. The camera obscura, literally, a “dark chamber,” was a portable box equipped with a convex lens and an internal mirror which righted the upside-down image created by the lens, so that it could be traced on a piece of paper placed on translucent glass plate installed in the top of the device. Drawings thus made could help artists to trace the outlines of shapes to be transferred onto canvas to achieve highly realistic and accurate, truly “photographic” paintings of landscapes and cityscapes, such as those by Canaletto (1697–1768) (Links 2005: 118). Before the invention of film and television the effects produced by the camera obscura must have been truly astounding: on the two-dimensional screen the viewer could see a three-dimensional scene, in its natural colours, fully animated, reduced in size and neatly framed. The camera obscura could capture a moving image (a contiguous iconic index of a scene), but it could not fix it to make it temporally displaced – this part was attempted by a painter who created a permanent icon out of a fleeting iconic index, losing the indexical character of the image in the process. This is why Canaletto’s paintings of Venice, Rome, and London, realistic as they are, are not as accurate, faithful, and “real” as would have been achieved even by a primitive, black-and-white photograph, to say nothing of today’s colour, high-definition digital images. Also, effective as the camera obscura was in tracing the outlines of buildings and perspectives of the streets, it was of no use in trying to transfer onto canvas the image of a human face, which consists of tones and shades rather than of lines. This is why the device could help artists to produce city paintings of admirable accuracy, but was of no help in painting portraits – a much more popular genre at the time.

An early attempt to capture a human figure, especially the head if not actually the face, and to fix it in a permanent iconic index were the silhouette cut-outs, popularized in the late eighteenth century by the Swiss scientist J.K. Lavater. The shadow of a person’s profile cast by sunlight or a candle was traced onto paper, and then the image was filled in by hand, or used by the artist as a template to cut a silhouette from black paper. Silhouettes, or shadow portraits, were part entertainment and part artistic venture, and their popularity drew on the widespread conception that human character could be read through the study of facial features (Marien 2006: 1, 5). Silhouettes were of course not as detailed and colourful as painted portraits, but were considered to be more faithful and truthful of a person’s appearance (and personality) than the latter, precisely because of their indexical rather than merely iconic origins.

The missing indexicality in painted images may be responsible for the popular subject of the “invention of painting” in early modern art, in which the origin of the art of portraiture was attributed to the observation and tracing of a person’s shadow. As the art historian Ernst H. Gombrich reminds us, the subject goes back to Roman poetic love tale recorded by Pliny the Elder (23–79 CE), in which Boutades, a potter of Skyon, discovered with the help of his daughter how to model portraits in clay. She was in love with a youth, and when he was leaving the country she traced the outline of the shadow which his face cast on the wall by lamplight. The father filled in the outline with clay and made a model (Pliny 1991: 187; Gombrich 1995: 31). The architect Leon Battista Alberti in his treatise *De Pictura* (1435) also quotes Quintilian as saying that “the earliest painters used to draw around shadows made by the sun, and the art [of portraiture] eventually grew by a process of additions” (Alberti 1972: 61). The popularity of this story in the Renaissance is also testified by Giorgio Vasari, who in his *Lives* (1568) recounts another version of the legend of the origin of painting. Accordingly, painting was first brought to Egypt by Gyges of Lydia, who once saw his own shadow cast by the light of a fire and instantly drew his own outline on the wall with a piece of charcoal (Vasari 1987: 27). The popular cut-out portrait silhouettes of the eighteenth century were based on the same quasi-photographic principle of combining the indexicality of a person’s shadow with the iconicity of traditional painted portraits, to achieve the accuracy and fidelity of representation unattained by conventional painting or sculpture. Pliny also gives an account of ceremonies for the dead in which mimes who physically resembled the departed would make them visible and “alive” again by putting on their death masks (Beyer 2003: 17). The ritual combined contiguity (live performance), iconicity (resemblance of the mimes to the dead), and indexicality (death masks), thus coming as close as was physically possible to “reviving” the dead, even closer than today’s practice of displaying the immobile dead body wearing life-simulating makeup in some funeral homes before the grieving relatives, or of watching the now dead member of the family on home video (an iconically indexical, but not a contiguous medium).

The uncanny truthfulness of representation achieved by the indexical method of silhouette cut-outs also gave rise to the vogue of the pseudo-science of physiognomics, which purported to read the character of a person from the record of a profile. Unlike the fleeting, immaterial, and fully contiguous shadow, a cut-out silhouette formed a fixed, fully displaced, and durable indexical outline of a person, very much like portrait photography that became all the rage in the nineteenth century. And like photographs, cut-out silhouettes attracted the same magical beliefs often associated in folklore with shadows. As said earlier, unlike the physical objects they reflect shadows lack solidity and substantiality, for which reason they were believed to belong to the immaterial, spiritual world. We cannot

touch or grasp a shadow, and so in ordinary parlance we often resort to the metaphor of shadows to describe anything unreal: shadow boxing is not real boxing, and the Shadow Chancellor is not the real chancellor. At the same time, by virtue of its indexicality the appearance of an immaterial shadow testifies to the solidity of an object, for what casts a shadow must be real. The physical connection between an object and its shadow also explains beliefs in shared properties between the two, as in the legend of the healing power of the shadow cast by Saint Peter, represented for example in a fresco by Masaccio (1425) in the Brancacci Chapel in Florence (Gombrich 1995: 21).

Because shadows or mirror reflections cannot exist without solid, material objects that produce them, in popular beliefs insubstantial ghosts do not cast shadows, or else they exist only as shadows or mirror reflections. In Eastern-European folklore mirrors used to be covered in a house where someone has just died, lest the soul of the dead person appear in it. These superstitions are comically exploited in Roman Polanski's spoof horror film *The Fearless Vampire Killers* (1967), in which two mortals: the Professor, played by Jack McGowan, and his assistant, played by Polanski himself, camouflage themselves in a crowd of vampires dancing at a ball. The disguise works until both the two mortals and the vampires stop their dance to look into a huge mirror hanging in the hall, which shows only the reflections of the mortals – an unmistakable giveaway of their flesh-and-blood solidity that prompts a comic chase after their very blood.

Photography versus painting

Photography in the true sense of the word started around 1802, when a member of the Wedgwood family (the pottery makers) wrote a pamphlet called *Description of a Procedure for Copying Paintings onto Glass and for Making Silhouettes by the Effect of Light on Silver Nitrate*. However, the credit for producing the first permanently fixed iconic indexes achieved by the photographic process of silver nitrate goes to the Frenchman Joseph Nicéphore Niépce, and his first camera picture taken in 1826. Its subject was a cityscape, a courtyard in Chalon-sur-Saône, rather than a human figure, mainly because the image required eight hours of exposure to be recorded on the photosensitive plate. It was Niépce's younger partner, Louise Daguerre, who in 1829 developed the first precise photographic images, which he called, after himself, daguerreotypes. In the decades that followed photography became all the rage, chiefly among rich enthusiasts, who carried their cumbersome and expensive cameras and tripods to take pictures of city squares, landscapes, historic monuments, and other large and immovable objects. The exposure time was gradually reduced to 15 minutes in full sunlight in the late 1830s, and

then to 20–40 seconds by the early 1840s (Briggs and Burke 2005: 133; Freund 1980: 22; Benjamin 1980: 199–216).

The fascination with the new, initially expensive but easy and quick way of making accurate and realistic pictures of the world went hand in hand with instant recognition of the fundamental difference between photographic images and traditional paintings. Unlike the latter, photography was first perceived not as an art but as a mechanical process of impersonally copying nature, while the photographer was thought to be merely a non-interfering observer – a scribe, not a poet. Indeed, while it obviously took human inventiveness and ingenuity to produce a camera in the first place, the very creation of the image was taken care of by the optical and photochemical processes largely beyond the photographer’s direct control: light reflected from objects was focused through the lens and exposed to chemically coated glass or metal plate, later replaced by flexible celluloid, before undergoing a complex chemical process resulting in a photograph – a static record (index) of reflected light at an instant in time. The earliest written accounts of photography often did not even describe the new medium in terms borrowed from machines, instruments, and processes of the Industrial Revolution, but in terms of nature and natural history. For example, the words “invention” and “discovery” were used interchangeably in reference to photography, while other technological achievements such as the railroad or the telegraph were unequivocally called inventions, despite the fact that they too were based on objective physical laws and processes. At the beginning photography was thus considered as a natural phenomenon, much like magnetism or electricity, which were also understood to be discovered rather than invented, and then applied to human use (Marien 2006: 23).

Of course the photographic process was not totally accidental, because it involved the photographer as the conscious agent, who chose the object to be photographed, placed the camera in front of it, and allowed the physical processes of nature to create a desired image. But it is these physical processes, applying largely beyond the photographer’s control, that determine the inherently indexical character of photography, so different from the iconicity of painting or drawing, which are created entirely by the artist. It is because of this fundamental difference between intentional and personal (iconic), and physical and impersonal (indexical) depiction that we say that a painting or drawing is *made*, whereas a photograph is *taken* (Friday 2002: 39). This is also why in popular (and instinctively correct) perception photographic images have a greater power to usurp reality than do paintings. In 1925 the painter-photographer László Moholy-Nagy wrote that “in the exact mechanical procedures of photography and the film we possess an expressional means for *representation* which works incomparably better than did the manual procedures of the representational painting we have known hitherto,” and that “painterly methods of representation suggestive merely of past times and past

ideologies shall disappear and their place be taken by *mechanical means of representation* and their as yet unpredictable *possibilities of extension*" (Moholy-Nagy 1969: 9, 15). While painting is never more than the stating of an interpretation, a photograph, in Susan Sontag's words, is "a trace, something directly stencilled off the real, like a footprint or a death mask," which turns a photograph into "a material vestige of its subject in a way that no painting can be" (Sontag 1978: 154).

Unlike paintings therefore, photographs are causally dependent on the objects they represent, whereas paintings are causally dependent only on the beliefs and skills of the painter. This also means that paintings, iconic as they are in relation to the objects depicted on them, are also indexical in relation to their authors, which explains why in popular perception paintings are valued not so much for their subject matter, as because of who painted them. Art critics, dealers and the general public seem to care less about what a painting by Da Vinci, Cézanne, or Picasso represents, than about the fact that it is a painting *by* Da Vinci, Cézanne, or Picasso. By the same token, the indexicality of photography explains why we are more interested in what photographs depict than in who took them, so that the photographers' names, even as important as those of Alfred Stieglitz, Robert Capa, or Henri Cartier-Bresson, are not as well known in popular culture as the names of some twentieth-century painters. This is also why naïve, commercial, or merely utilitarian photography is no different in kind from photography as practised by the most accomplished professionals: there are pictures taken by anonymous amateurs which are just as interesting, as formally (if inadvertently) sophisticated as professional artistic photography. The value of a photograph will thus depend always on its subject, even if it is seen subjectively by an (often amateur) photographer. The stylistic, subjective characteristics of photography, such as controlled lighting, skill of composition, clarity of subject, precision of focus, print quality, elitism of gallery exhibition – features borrowed from painting – are extraneous to the essence of photography. Its indexical nature, which guarantees a closer relation with the represented subject than can ever be achieved in merely iconic painting, means that amateurish, unposed, crudely lit, asymmetrically composed photographs can be just as interesting and compelling, if not more, than the most accomplished paintings.

The differing perceptions of indexes and icons as forms of social communication also explain the different values attached to original works of art, their copies and forgeries. An original painting is its author's index as well as a unique article, and its high value, material and symbolic, is due both to its direct, physical connection with the painter and to its uniqueness. In the case of old paintings there exists an additional historical value due to the painting's spatially contiguous relation to the original context of production. Copies of original paintings, on the other hand, are simply icons of unique articles, and their comparatively smaller value is due both to their lack of contiguous relatedness to original authors and to

their possibly multiple number. Art forgery in turn is obviously a form of substitutive deception: a forged work of art is an exact copy (icon) of a unique original article, indexical only in relation to its often obscure author, which is now passed off as the genuine, original and unique article, supposedly indexical in relation to a famous painter and the original historical context of production.

The inherent ability of photography to transcribe external reality from its inception gave the medium its documentary validity as both accurate and seemingly unbiased. Edgar Allan Poe, whose daguerreotype portrait was made in 1849, wrote in an article on photography for a popular magazine in 1840 that “the closest scrutiny of the photographic drawing discloses only a more absolute truth, a more perfect identity of aspect with the thing represented” (Trachtenberg 1980: 38). Over a century later Susan Sontag would say that just as a written description, or a handmade visual image such as painting or drawing are only interpretations of reality (symbolic and iconic, respectively), photographic images, because of their indexical character, do not seem to be statements about the world as much as pieces of it, miniatures of reality that anyone can make or acquire (Sontag 1978: 4). This is why taking photographs and manipulating them gives one a sense, illusory as it may be, of ordering and somehow controlling reality. A crudely chronological order of snapshot sequences posted in family albums, or the dogged accumulations and meticulous filing of photographs used in weather forecasting, astronomy, microbiology, geology, archaeology, art history, medical training and diagnosis, military reconnaissance and police investigations turn information about a fragment of the outside world into systems of classification and storage. The indexical nature of photography gives the information thus attained the quality of objective evidence rather than of merely subjective impression, which is why photographs, film or video footage (from CCTV cameras for example) are used as indisputable and hard evidence in courts, together with fingerprints or DNA samples (the latter as displaced indexes and displaced metonymic signs respectively). The earliest recorded instance of the use of photography in police investigations was the roundup of the Communards in Paris in June 1871. During the Franco-Prussian War of 1870 and the short-lived Paris Commune of 1871, hundreds of pictures were taken of the Communards, who willingly allowed themselves to be photographed on the barricades. When the Commune fell, the police used these photographs to identify the Communards, who were nearly all executed. Since then photographic, film, and video evidence has been a useful tool of modern states in the surveillance and control of their increasingly mobile populations (Freund 1980: 108).

The value of the photographic image both as a truthful record of external reality and as evidence in crime investigations has been both explored and challenged in Michelangelo Antonioni’s classic film *Blow Up* (1966). In the film, a professional

photographer accidentally captures on his camera what he thinks is a record of a murder committed in a park. Details such as a hand with a gun sticking out of a bush and what looks like a dead body lying on the ground are beginning to show once the photographer enlarges the pictures in his darkroom. However, the larger the incriminating images are the less clear they become, as the blown-up grain blurs the details, rendering them unintelligible and therefore unreliable as possible evidence of the alleged crime. Paradoxically, the closer the photographer wants to get to the “truth” of the crime using the supposedly objective photographic process, the farther he moves from actually furnishing any convincing evidence. The largest blow-up of the crucial element of the crime scene, the dead body, ultimately looks on the photographic print like a piece of abstract art – blurred and indistinct beyond recognition, just a chaotic pattern of black and white spots rather than a realistic image of anything that would persuade anyone about the supposed murder. Antonioni seems to remind us both of the limitations of the photographic medium to represent reality, and of the mechanical, artificial, and ultimately elusive character of the photographic process, which reflects reality more because we want to believe it than because of its objective, physical nature.

Photography and the human face

For technical reasons (long exposure) the earliest photographs depicted city squares, courtyards, streets, historical monuments, landscapes and other immovable objects, but as soon as the exposure time was reduced to 20–40 seconds around 1842, the most popular photographic object became – predictably – the human face and figure. As said earlier, the recognition of personal identity, interpretation of facial expressions and of body language appear to be governed by cognitive modules involved in our social life, which alert us instinctively to facial features, to identities and personalities of socially important people as well as of people related or known to us. Just as we are interested in the physiognomies of high-status, public figures—what we today call celebrities—so we are universally fascinated by family resemblances and – not least – by our own faces. Family histories and genealogies as a function of expanded memory must have been a human preoccupation since the beginning of consciousness and the first awareness of the transience of individual life. Individual portraits, however, come late in the history of visual representation, to culminate in Roman marble busts – three-dimensional icons of remarkable realism, which included also the earliest portrait “photographs”: indexical wax masks of dead members of Roman families. With their no-nonsense approach to reality the Romans insisted upon an exactitude that included every wart, pimple, wrinkle, and blemish in their portrait busts,

which were certainly done from life, like much later painted portraits or photographs (Woodford 1982: 84).

The development of the photographic portrait in the nineteenth century corresponded with the rise of the middle classes in Western Europe: by having one's portrait done an individual of the ascending bourgeoisie could visually affirm his or her new social status. In this the bourgeoisie followed the model of aristocratic portraiture executed on canvas, of portable, miniature portraits on powder boxes and pendants, with tiny portraits of friends, lovers, and relatives. However, by 1850 the miniature painted portrait had all but disappeared under the influence of the new medium of photography. For one-tenth the price of a painted portrait, the photographer could furnish a likeness which satisfied both the taste and the pocket of the widening spectrum of middle-class population (Freund 1980: 9–11).

The long-established obsession with family history thus received a truly miraculous aid in the form of a new medium which – for the first time in history – allowed people to know exactly what they looked like when they were younger, and what their parents and grandparents looked like as children. We all change throughout our lives from day to day, from year to year. The famous series of Rembrandt's self-portraits from youth to old age shows the artist studying this relentless process, but it is only with the coming of photography that we have all become fully aware of this effect of time. We look at the snapshots of ourselves and of our friends and family taken a few years ago, and we recognize with a shock that we all have changed much more than we tended to notice in the day-to-day business of living. This is because the feeling of constancy completely predominates over the changing appearance (Gombrich 1982: 107). Before the invention of the camera not even a tiny minority of the rich who commissioned paintings of their children could possess that knowledge, as even the best painted portraits, due to their iconic nature, were less informative than is a casual family snapshot. To a much greater extent therefore than eighteenth- or early nineteenth-century portrait painting, photography began to actively promote nostalgia which turned the new medium into a form of elegiac art. In the words of Susan Sontag again: "All photographs are *memento mori*. To take a photograph is to participate in another person's (or thing's) mortality, vulnerability, mutability. Precisely by slicing out this moment and freezing it, all photographs testify to time's relentless melt" (Sontag 1978: 15).

Given the evolutionary reasons for the universal preoccupation with family histories and for the nostalgic awareness of the passing of time, it comes as no surprise that once photographic portraits became technically possible they quickly rendered obsolete the art of the portrait as it was hitherto practised by painters, miniaturists, and engravers. Gustave Courbet (1819–77), the founder of Realism in painting, could argue that his aesthetic ideal as a painter was "the scrupulous imitation of nature," but the tenet of the Realist manifesto (1856), "One cannot

paint what one does not see” was, with the substitution of one word, a truism in photography (Gernsheim and Gernsheim 1969: 245). Indeed, many of the traditional artists became the first photographers, and their previous experience as painters and craftsmen was partly responsible for the high quality of the photographic industry during its early days. For instance, one of the most eminent photographers of mid-nineteenth century, Félix Tournachon Nadar, began as an illustrator and caricaturist before he opened his photographic studio in Paris in 1853. Important figures in the arts, literature, and politics flocked there to be photographed, including the painter Delacroix, the composer Meyerbeer, the poet Baudelaire, or the revolutionary Bakunin. Queen Victoria and Prince Albert bought their first daguerreotypes in 1840. When the daguerreotype was introduced in America in 1839, the total output of photographs taken during the next few decades consisted in ninety-five percent of portraits. With lower prices and greater speed of production, the photograph put the painted portrait out of business within two generations, creating real *daguerréomanie* in Europe and America (Sontag 1978: 15; Freund 1980: 35, 41; Briggs and Burke 2005: 133).

Predictably therefore, the earliest popular use of photography was to memorialize the appearance, growth, and the achievements of family members, especially on such celebratory occasions as births, weddings, holy communions, confirmations, graduations, birthdays, Christmases, parties, and of course holidays. At first to have a photograph taken of themselves people had to go to the photographer's studio, with its choice of painted backgrounds and plaster pillars. The popularity of family photographs was increased after the 1880s, when the camera became more mobile and could enter more freely the private and domestic space. Eventually, photography permitted an unprecedented range of people to look at relatives whom either space or time had taken from them. Everyone, not just the privileged and wealthy few as was the case in the era of painted family portraits, could acquire a visual sense of their own past, to see before them their own genealogy, and to be able to pass their image to later generations that would know their faces (Hirsch 1981: 44). The opportunity to gratify one's nostalgia about the past and to anticipate the future – both functions of human conscious memory and the social instinct focused primarily on one's kin – was thus provided by the invention of and popular access to the iconic indexes of photography, which for the first time in history granted a gift of visual immortality on its users.

The introduction of small, portable, easy-to-operate cameras, notably by Kodak, towards the end of the nineteenth century led eventually to the decline of professional studio portrait photography (Freund 1980: 86). Hundreds of thousands of people were now learning to take their own pictures recording the main events of their lives, which in semiotic terms meant converting direct, contiguous signs into indirect, displaced iconic indexical signs. Private cameras became

inseparable from tourism, both as a way of collecting visual trophies as evidence of trips taken and places visited, and as a way of relieving the stress of travelling and of adapting, if only for a brief time, to new surroundings. The very activity of taking pictures is soothing and reassuring, in assuaging general feelings of disorientation and anxiety that are likely to be exacerbated by travel. This is probably why given the choice between buying a superior photographic postcard of a visited place and taking an inferior picture with one's own camera, most people prefer to do the latter. The popularity of postcards, whose value as iconic indexes was comparable to that of privately taken photographs, was the greatest in the early decades of the twentieth century, when relatively few people could afford their own cameras (Freund 1980: 99). Today, in the age of cheap storage of digital pictures on personal computers, the traditional postcard and even printed photographs seem to be gradually disappearing both as records of one's travels and as a way of keeping friends and family informed about one's holidays. (The latter function is now being taken care of by electronic mail, mobile telephoning and text messaging.) While it can be argued that taking pictures all the time while on holiday gets in the way of contiguous, direct sensory experience, photographing the visited places seems to establish a sense of instant appropriation and an illusion of control over the new and otherwise unfamiliar environment. In the long term, photographs will also exist as indexical records and memory aids of events that have ended, of people who have gone away or died, conferring a kind of immortality and importance that the photographed objects would never otherwise have attained.

The "magical" sense of appropriation and illusion of control over photographed objects are also responsible for the often uncomfortable feeling people have when being photographed. The anxiety is due to the combined effects of photographs as iconic indexes and of our instinctive, if illusory and incorrect, recognition, underlying universal magical thinking, that both indexes and icons have a direct though hidden sympathetic link with the objects they depict, in this case with us. I said earlier that treating displaced indexes as contiguous signs, in other words mistaking records of objects for objects themselves, lies at the heart of contagious magic as identified by James George Frazer. On the other hand mistaking icons of objects for the very objects underlies the other common type of magic, called by Frazer the homeopathic magic, which is based on the principle of similarity, whereby things that resemble one another are believed to possess an invisible, but direct, sympathetic link, so that by manipulating the icon one can also manipulate the object depicted by the icon (Frazer 2002: 12).

Homeopathic magic normally assumes that the object exists independently from the human observer, who employs imitative magic in the illusory wish to exercise control over that object. Pushed far enough, the belief in the direct connection between image and object can lead to a conviction that by creating an

image one can somehow, again magically, bring the represented object into life. In a myth handed down to us in Ovid's *Metamorphoses*, the sculptor Pygmalion wants to fashion a woman after his own heart and falls in love with the statue he makes. He prays to Venus for a bride modelled after the image, and the goddess turns the cold ivory into a living body (Ovid 2002: 302). For Ernst H. Gombrich the myth of Pygmalion expresses the artist's ultimate dream in the power of art to create rather than just to portray (Gombrich 2003: 80, 84). On the other hand, in semiotic terms the story appears to reflect the desire to turn an iconic sign, which only resembles its original, into a contiguous sign, which is the original itself, again to exercise illusory control over the original object created according to one's own wishes. However, the artist's ultimate dream illustrated by the myth of Pygmalion, just like homeopathic magic in general, must remain an illusion: objectively speaking there is no physical, causal connection between icon and original, because icon is an index of the system that created it, and not of the original object represented by it. Artistic representation will therefore always remain distinct from the reality it resembles, as artists more sober than Pygmalion usually acknowledge. A lady once visited the studio of the painter Matisse and commented on his work in progress: "But surely, the arm of this woman is much too long." The artist famously replied: "Madame, you are mistaken. This is not a woman, this is a picture" (Rogers and Rogers 1986: 105).

On the other hand, in the world of the child or the naïve adult there is no clear distinction between reality and appearance, between a contiguous object and its iconic representation. The child can use a table upside down for a spaceship, and a basin for a crash helmet. For a child, still immersed mentally in homeopathic magic, the basin does not "represent" a crash helmet; it *is* a kind of improvised helmet. Magic may be largely a thing of the past among most educated, adult people in the West, but quasi-magical feelings still affect our iconic thinking, even if we *know* that two similar objects are in fact two different, unconnected objects. For instance, most people still feel fear or disgust at touching an object resembling an offensive substance, such as a chocolate dog turd which is, objectively speaking, perfectly edible and tasty, but which is for many people tainted and disgusting by mere resemblance to real dog turd. Residual homeopathic magic is also at work when we agree to suspend our disbelief and allow ourselves to be engrossed by a movie, aroused by pornography, or terrified by a roller coaster – when the similarity of iconic image or action triggers the same emotions as the real thing.

The psychologically compelling power of iconic images, as in painting and sculpture, can be considerably enhanced if the iconic image has also indexical qualities with regard to the represented object, as is the case with photography. In this sense a photograph, or a related device such as the camera obscura, can exert an even more powerful "magical" effect than painting, precisely because of its

combination of indexicality and iconicity and the related combined effects of contagious and homeopathic magic. The English explorer Edward Dodwell relates in his *Classical and Topographical Tour through Greece* (1809) how he managed to get rid of the Turkish governor (Disdar) who constantly put difficulties in Dodwell's way, which could only be overcome by "gifts," until one day he got rid of the mercenary Turk in a most extraordinary way. When Dodwell tried to explain the camera obscura he was using, the Disdar

no sooner saw the temple [of Acropolis] instantaneously reflected on the paper in all its lines and colours, than he imagined that I had produced the effect by some magical process; his astonishment appeared mingled with alarm.... He again looked into the camera obscura. At that moment, some of his soldiers happening to pass before the reflecting glass, were beheld by the astonished Disdar walking upon the paper: he now became outrageous, and after calling me pig, devil and Buonaparte he told me that if I chose I might take away the temple and all the stones in the Citadel, but that he would never permit me to conjure his soldiers into my box. When I found that it was in vain to reason with his ignorance, I changed my tone, and told him that if he did not leave me unmolested, I would put *him* into my box, and that he should find it a very difficult matter to get out again (Gernsheim and Gernsheim 1969: 29).

Visibly alarmed, the Disdar immediately retired discomfited, and henceforth carefully avoided Dodwell and his dangerous box.

A person from the iconoclastic Islamic world may have reacted with superstitious fear to the allegedly appropriating power of photographic images, but even in the West, with its history of rich visual culture, people still tend to feel apprehensive and self-conscious at having their pictures taken. We know rationally that cameras do not "steal our souls" and take us into the photographer's possession, as tribesmen were reported to feel when first confronted with a white man's camera, and therefore we do not panic when we are being photographed. Still, the residual magical fear remains, making us feel awkward and uncomfortable, as if our privacy has been invaded, some trespass and disrespect have taken place, and indeed as if some material part of ourselves has been "stolen" by the photographer. Few people in today's Western societies share the primitive dread of cameras, but some trace of irrationalism is still there, as seen in our reluctance to tear up or throw away a photograph of a once loved one, or of someone dead or far away.

Interestingly but probably not surprisingly, our anxiety about being photographed seems to increase with age. Just as youth, the time when we are better looking (a cue of fertility) is for biological reasons preferable to old age, the time when we are less good looking (because past our fertility), so we generally prefer ourselves on photographs taken at younger age. As we grow older we dislike being photographed because we do not want to be reminded by the camera that we are

not as young and attractive as we once were. In fact, we even tend to look “older” on photographs, especially on casual snapshots, mainly because our attention is sharper when looking at a new object (the photograph) than when looking at our all-too-familiar reflection in the mirror. The much stronger and “panicky” reaction of tribesmen to seeing photographs of themselves may also be due to the shock of actually seeing their own faces for the first time.

If our photographic anxiety increases with age, then we should be least uncomfortable to be photographed when young. Indeed, teenagers and people in their twenties generally like having their pictures taken, provided they look “cool” on them, that is, relaxed, at ease, self-assured, and in control, not tense or self-conscious. Having a photographic copy, or better still, multiple iconic copies of oneself at the prime of one’s life is actually a very desirable way, especially for women, of advertising one’s phenotypic quality as widely as possible. This desire is greatly facilitated today by the visual mass media such as the MTV Channel for example, which shows practically nothing else but young, good looking, vivacious, bouncy, assertive, laughing and smiling young people of both sexes, whose body language and tone of voice (never mind what they actually say) communicate to millions of viewers their health, vigour, and sexual attractiveness, that is, indirectly their good genes. As we grow older and less attractive we begin to be afraid of the camera’s disapproval, and when photographed we want to look “our best,” which requires some preparation, more in women than in men one would predict, before the picture is taken: adjustments in dress, hair and makeup, assuming a bodily posture suggesting good fitness, putting on a rejuvenating smile and so on. Older people will only tolerate being photographed when given the opportunity to manipulate their appearance before the picture is taken, and they absolutely hate surprise, casual, unprepared snapshots of themselves (even if they do not always say so). Again, mature women probably more so than mature men want to see an idealized, beautified and rejuvenated photographic image of themselves, and they feel embarrassed and annoyed when the camera does not present them as more attractive than they actually are at their age.

For this reason older or less attractive people not only tend to manipulate their own appearance before being photographed, but they also expect and often insist on manipulating the picture after it is taken. As early as the mid-1840s, a German photographer invented the first technique for retouching the negative, and his two versions of the same portrait – one retouched, the other not – astounded crowds at the Exposition Universelle held in Paris in 1855 (Sontag 1978: 86). Retouching, involving the removal of wrinkles, warts and so on, is basically a form of intentionally reducing the indexicality (that is, truthfulness) of the photographic image, and of increasing its iconicity, thus bringing it closer to the traditional painted or drawn portrait. In this way a retouched photograph, like plastic surgery, falsifies

reality in order to flatter our vanity, by making us believe that we are younger and better looking than we actually are.

However, no matter how anxious and uncomfortable we felt at the time of being photographed, and how much we disliked our portrait when we first saw it, we tend to like photographs of ourselves with time – as we grow older we always prefer images of ourselves when we were younger. In this way portrait photography exerts a double psychological effect on us: on the one hand it is a way of arresting the damages caused by time and of achieving a sort of perennial youth, and on the other hand photographic portraits are a sobering reminder of how illusory and self-deceptive our desire to freeze the past is, as the difference between the face on the photograph and the face in the mirror grows wider and wider with time. One is reminded of the pathetic obsession with which an ageing silent film queen, played by Gloria Swanson in Billy Wilder's *Sunset Boulevard* (1950), watches over and over again the old films in which she starred, living totally in the illusion of the past, unable to accept the passage of time. The two opposite effects of photography, one giving us a pleasing illusion of timelessness and the other painfully reminding us of the actual passage of time, thus cancel each other out, leaving us not better off perhaps than were the people before the age of photography, who never had to experience the frustration of comparing their current appearance with their younger image. Without photographic portraits people are both denied the pleasure of seeing their young selves “immortalized,” and spared the anguish and nostalgic sorrow at seeing their youth gone.

The popularization of photography in mid-nineteenth century, like the invention of moving pictures later in the century, marked the beginning of iconic indexical culture that was to dominate Western societies, gradually replacing the early modern culture based on iconic, painted images and the printed text. Photography not only offered a democratic opportunity for anyone to possess and contemplate their own and their family's realistic portraits – it also affected every aspect of social life, providing the technological basis for twentieth-century visual mass media such as photojournalism, advertising, film, television, video, DVD, and the Internet. Before the introduction of newspaper photography ordinary people could visualize only those events that took place in their contiguous, immediate space: in the street, in the village, or on the battlefield. Newspaper photographs and later documentary film and television, due to their iconic indexicality and wide dissemination, offered an opportunity of surrogate participation in events not directly experienced, thus enlarging the near-contiguous (in the case of photography and film depicting recent events) and fully contiguous (in the case of live television) sphere of interaction with the increasingly global social environment.

In Western societies from the turn of the nineteenth century photography, alongside the traditional printed word, became a powerful tool of keeping the

public informed, and of influencing and manipulating their views and opinions. The first newspaper photograph was printed in 1880 in the *New York Daily Herald*, using the process known as halftone, which allowed both the photographic image and the printed text to be run through the press at the same time (Freund 1980: 104). Before that illustrations in the newspapers were scarce and consisted of handmade, that is, iconic, wood engravings. Initially, for technical reasons even photographs were reprinted in the newspapers as engravings with a note “after a photograph,” which both assumed the public’s familiarity with the new medium and reinforced the veracity and accuracy of the engraving. Today thousands of newspapers and magazines print millions of photographs daily, most of them in colour for increased realism and authenticity, allowing hundreds of millions of people around the world to expand their immediate, contiguous experience with visual, spatially displaced iconic indexes of events not directly accessible, enabling people to share the same information practically across the globe at the same time. Still photography is now of course supported by the related medium of television, which has a two-fold communicative advantage over photography: it presents persons and objects in realistic movement, and in live broadcasts it provides an indexical experience of spatially displaced but simultaneous events, at least of those deemed important by television agencies to be communicated to the general public. Realistic movement and simultaneity with regard to represented objects and events were the two main features missing in nineteenth-century photography. But as soon as technology made these effects possible, the photographic media, especially television, moved even closer to providing a surrogate, fully contiguous representation of life for millions of people across the globe.

CHAPTER 6

Photography plus movement, or even more magic

Humans and most other animals appear to be predisposed to pay instinctive attention to all movement taking place within the physical range scanned by their senses, in humans mostly by vision. In our evolutionary history moving, self-propelled, laterally symmetrical objects tended to be either animals or other humans, and it paid in survival terms to keep a watchful eye on what these objects were doing: did they behave like friends or like enemies, did they look like potential sources of food or like potential predators. There are deep evolutionary reasons why motion is the strongest visual appeal to attention (Plotkin 1994: 103; Allen and Saidel 1998: 195; Schiffman 1996: 195). A dog or a cat may be resting peacefully, unimpressed by all the lights and shapes that make up the immobile setting around them, but as soon as anything stirs, their eyes will turn to the spot and follow the course of the motion. Young kittens seem completely at the mercy of any moving thing, as though their eyes were glued to it. Human beings are similarly attracted by movement, as evidenced by the effectiveness of mobile advertising, whether it be flashing neon signs or TV commercials, or by the much greater visual appeal of performances in motion as compared to still photography, painting, sculpture, or architecture (Arnheim 1974: 372). Given this universal propensity of the human nervous system, a device that would add movement to still photographic images to enhance their realism and visual attractiveness was in a sense only waiting to be invented.

The birth of cinema

The device in question is of course the medium of film, in semiotic terms defined as animated iconic indexes. If such is the definition, then the first “cinema screening” ever described must be Plato’s celebrated allegory of the cave from *The Republic*. In its original philosophic context the allegory was designed to illustrate the limited extent of human knowledge about the world as revealed by the senses:

Imagine an underground chamber like a cave, with a long entrance open to the daylight and as wide as the cave. In this chamber are men who have been prisoners there since they were children, their legs and necks being so fastened that they

can only look straight ahead of them and cannot turn their heads. Some way off, behind and higher up, a fire is burning, and between the fire and the prisoners and above them runs a road, in front of which a curtain-wall has been built, like the screen of puppet shows between the operators and their audience, above which they show their puppets.... Imagine further that there are men carrying all sorts of gear along behind the curtain-wall, projecting above it and including figures of men and animals made of wood and stone and all sorts of other materials, and some of these men, as you would expect, are talking and some not.... do you think our prisoners could see anything of themselves or their fellows except the shadows thrown by the fire on the wall of the cave opposite them?... if they were able to talk to each other, would they not assume that the shadows they saw were the real things? (Plato 2003: 241).

Plato's parable illustrates the limitations of human perception and cognition (in not being able to see things "in themselves" but only their indexical reflections), but the description also bears a resemblance, *mutatis mutandis*, to a modern cinema screening, in that both Plato's shadows and the moving photographic images projected on the cinema screen are iconic indexes, reflections of invisible things that caused them. (With an important difference in that Plato's shadows are fully contiguous animated iconic indexes, whereas film consists of spatio-temporally displaced animated iconic indexes.) Also, unlike the spectators in Plato's cave cinema viewers are not prisoners tied to their seats and forced to look only at the screen, nor is the film we are watching a mechanical reflection of reality, because in addition to being an index it is also an icon, an artificial product partly created by human imagination. Only a naïve viewer will mistake a fleeting cinematic image for solid contiguous reality: children often do that, as does the frustrated housewife from Woody Allen's film *The Purple Rose of Cairo* (1985), who believes that a dashing film character falls in love with her and steps off the screen to join her in the real world.

The medium of cinema as we know it came upon the scene in the mid-1890s, at the end of a century that saw a vast proliferation of visual forms of popular culture, not only of printed photographs but also of mass-produced lantern slides, illustrated fiction, *dioramas* (painted backdrops with three-dimensional figures depicting famous historical events), circuses, "freak shows," amusement parks, music halls, theatre, opera and so on. Cinema offered an advantage over these contiguous forms of visual entertainment in that its displaced indexical images could be copied and disseminated more widely: multiple prints of the same film made sure that the cinema could offer a cheaper and easier way to organize entertainment for the masses. Live performances in theatres and music halls, despite their attractiveness as fully contiguous events compared with the displaced indexicality of the cinema, were more expensive and took more organizing to

produce. On the other hand film, once made, could be copied relatively cheaply and then shown to audiences around the world, its initially silent quality allowing also for distribution across language barriers. Movies would become the most popular visual art form of the late Victorian age and would define, together with its younger sister television, the audio-visual technological character of twentieth-century popular culture, with its easily accessible, democratic photographic images, complete with movement and fully synchronous ambient sound.

The main technological prerequisite for the invention of cinema was the ability to use photography to make successive pictures on a clear surface. The exposure time would also have to be short enough to allow for sixteen or more frames to be seen in a single second, after scientists realized that the human eye will perceive smooth motion if a series of slightly different images was placed before it in rapid succession, minimally around sixteen per second. The medium of cinema depends upon two physiological deficiencies in our visual system. Firstly, the retina is unable to follow rapidly changing light intensities: at critical “fusion” frequency more than fifty flashes per second will create the impression of steady light. Secondly, the phenomenon known as apparent motion occurs when the eye sees a string of displays as a single moving one. This effect depends on the fact that the eye will infer movement from an intermittent input if the jumps are not too large. Flicker fusion and apparent motion illustrate how automatic and mandatory the physiological, bottom-up processing in film perception is: although we know that a film is only a stroboscopic display of fixed frames, we cannot fail to construct continuum light and movement (Haber and Hershenon 1980: 122). The cinema also required that photographs showing different stages of movement be printed on a base flexible enough to be passed through the camera rapidly. In 1888 George Eastman devised a still camera that made photographs on rolls of sensitized paper, and the next year he introduced transparent celluloid roll film, creating a breakthrough in the move toward cinema. Finally, to film movement cameras had to be fitted with an intermittent mechanism, based as it happened on the sewing machine (invented in 1846) to allow for a stop-and-move passage of the celluloid strip through the camera at the rate of sixteen, and later twenty-four frames per second (Thompson and Bordwell 2003: 14).

The first public screening of motion pictures famously took place in the Grand Café in Paris on December 28, 1895, where the brothers Louise and August Lumière astonished their audience with a close view of August and his wife feeding their baby (the first home movie ever); a staged comic scene of a boy stepping on a hose to cause a puzzled gardener to squirt himself (the first slap-stick comedy); and a shot of the sea (the first nature film). Other early films by the Lumière brothers impressed the audiences with the sight of a train arriving at the station, with passengers embarking and disembarking, and a shot of workers leaving a factory

(the first documentaries). Each film consisted of a single take of about forty seconds' duration, shot from a camera fitted with a standard lens and placed on a stationary tripod to simulate a point of view of a standing person witnessing the event. For many days long lines of spectators waited to see the films, and the Lumière brothers quickly exploited their success, sending representatives all over the world to show and make more films. The cinema soon became part of news media and of popular entertainment in the late 1890s.

Interestingly, most subjects of the early short films were non-fiction, or actualities, the prototype of later television news reports, that is, film records of recent (that is, temporally near-contiguous) but spatially displaced events. The films included topical, or news reports offering brief coverage of current political, cultural, or military events as well as of accidents. Also popular were short documentaries, scenics and travelogues, offering views of distant cities and landscapes. In most cases cinematographers would cover events in the locations where they occurred, thus offering truly indexical, authentic records of distant events. On many occasions, however, filmmakers recreated current events in the studio – both to save money and to make up for the fact that cameraman had not been at the scene. In 1898, for instance, both American and European producers used model ships in miniature landscapes to re-create the sinking of the battleship Maine and other occurrences relating to the Spanish-American War. Audiences probably did not believe that these faked scenes were actual records of real events; rather, they accepted them as representations of those events, comparable to engravings in news-magazines (Thompson and Bordwell 2003: 21). Semiotically speaking, real news films or photographs are *displaced iconic indexes* of events; films or photographs containing fake, or staged scenes are *displaced indexical icons* of events; engravings or drawings in newspapers and magazines are *displaced icons*, while written or spoken reports of events use linguistic, that is, arbitrary, *displaced symbolic signs*. The four types of signs thus offer a respectively increasing perceptual and cognitive distance from real, contiguous events, such as those experienced by an eye witness for example.

The distinction between iconic indexes and indexical icons thus underlies our differing reactions to photographs and films of real events on the one hand, and to photographed or filmed reconstructions of events on the other hand. Iconic indexes, precisely by virtue of their indexicality, have a causal, physical relationship with real-life objects, persons, and events they depict. On the other hand indexical icons, by virtue of their iconicity, do not possess this direct, causal link with the events they reconstruct, despite their photographic, that is, indexical medium. The two types of photographic signs thus reflect the respective differences between documentary photography and film on the one hand, and dramatized photography and film, or mock documentary, on the other hand. If the aim of photography

or film is primarily to inform the viewers about events that really happened, then iconically indexical signs, even of poor quality, are preferable as more truthful and authentic. On the other hand, if the object of photography or film is either to offer the photographer's and the filmmaker's interpretation of what happened, or a representation of entirely fictitious events, then indexically iconic signs can do the job. It is clear, however, that indexical icons, despite their visual, photographic resemblance to the events in question, have no direct, causal connection with these events and are therefore perceived as less truthful and authentic. As in the early days of photography and film, whenever original, documentary material is not available, photographers and filmmakers of today resort to staged reconstructions of events, as in television crime or history programmes, which are often made to look like real documentaries, that is, like iconic indexes. Such staged reconstructions are often deceptively similar to real, documentary footage, by being shot with hand-held cameras for example, inviting the audience to succumb to the illusion of watching a filmed event as it really happened, although it is obvious that what is presented is an iconic reconstruction, not a true indexical record of the event.

For example, because of the legal ban on media presence in courts, the pop star Michael Jackson's case of alleged child molestation in 2005 was staged with actors outside the court almost simultaneously with the actual hearings, to give the news-hungry TV viewers at least some visual material, iconic rather than indexical, instead of a perceptually even more distant mere verbal, that is, symbolic report of what was happening behind the closed doors of the courtroom. Obviously, for Michael Jackson fans or the paparazzi the most desirable experience would have been to be actually present in the court during the hearings, that is, to avail of fully contiguous communication with the event. Second best would have been a televised live transmission, providing spatially displaced but simultaneous iconic indexes of the hearings. Next in perceptual attractiveness would have been a television broadcast after the event, providing both spatially and temporally displaced iconic indexes of the proceedings. Even less exciting but still better than nothing is what was actually shown on television: a staged reconstruction providing both spatially and temporally displaced indexical icons of the event. Finally, least satisfying from the point of view of a person anxious to witness the event would have been a post-factum mere verbal report, however factually accurate, providing both spatially and temporally displaced symbolic representation of the proceedings. Both the newscasters' verbal reports and visual, iconic reconstructions of events seen on television are generally believed to be "truthful," in the sense that they indirectly but accurately depict what really happened, and they can usually supply more complete information than a fragmentary documentary (indexical) footage. Still, when it comes to important public events, even a single casual photograph taken by a chance witness, a brief low-definition video made with a mobile

telephone, or a poor-quality amateur sound recording are perceived as truer and more authentic than an impeccably produced dramatized reconstruction of the complete event, which looks disappointingly inauthentic and fake to a viewer anxious to know about the facts as they actually happened.

On the other hand, if the aim of photography and film is not to inform the viewers about real events but undisguisedly to present fictitious, staged scenes, then indexical icons of artistic photography, of feature film and television drama are liberally used as the producers' imagination and audiences' expectations dictate, quite independently of any actual events in the world outside the photographer's or the filmmaker's studio. Fiction films as visual equivalents of literary narratives were popular right from the beginnings of cinema, as first exemplified by the Lumière brothers' comic gag with the squirted gardener (*L'arroseur arrosé*). A typical public screening in the early days of cinema would include a mixture of scenics, topicals, as well as fiction films in a single program (Thompson and Bordwell 2003: 22). A cinematic show would also have some musical accompaniment, if only to drown the whirring sound of the projector, although in some cases exhibitions had noises, that is, sonic icons, synchronized with the action on the screen to supply the missing audio dimension for increased realism. The iconic indexes of short scenics and topicals later developed into newsreels, documentaries, and television news bulletins, while the indexical icons of fiction films evolved into the huge industry of feature film production, later including television dramas and sitcoms.

The mirror and contiguous iconic indexicality

The photographic media, that is, still photography as well as motion pictures and television, have thus provided, for the first time in history, a possibility of creating displaced iconic indexical images and of cheaply copying and communicating them to practically everyone, as is clearly the case in today's media-saturated global culture. I related the particular perceptual attractiveness of the photographic media to the inherently indexical nature of the photographic process, which creates an illusion of a physical, causal connection with the represented reality, and which can effect a degree of realism and accuracy of representation unattained by purely iconic forms of displaced visual communication such as painting, drawing, or sculpting. I also emphasized the fact that the need to create permanent images is a consequence of the uniquely human extended working memory, and of the resulting awareness of the passage of time, with the accompanying feelings of anxiety and nostalgia. Important as memory is as the foundation of consciousness and as a prerequisite of material culture (the latter as a form of collective memory aid),

at least as vital for human experience of the world is contiguous communication, resulting from our instinctive alertness to events happening in our proximity – disposition we share with all other species, mainly engaged in contiguous transactions with their environment.

The primary system of contiguous visual communication is provided by the visual pathway, consisting mainly of the eyes, the optic nerve, and the occipital cortex in the brain, where the visual stimuli are interpreted. This natural system can be enhanced by such man-made optical devices as the spectacles, the binoculars, the microscope, and the telescope. On top of that, largely as a result of our consciousness and the capacity for meta-thinking, there is a possibility of creating a culturally mediated secondary system of contiguous visual communication. One of the manifestations of this uniquely human possibility is social ritual and drama, where the contiguously enacted body movements, gestures, costume, facial expressions, including the voice, music and other sound effects, can code iconic and symbolic meanings referring to events, ideas and emotions that are spatio-temporally displaced from their contiguous audio-visual ritual and dramatic enactments.

Other examples of secondary contiguous visual communication include such indexical representations as reflections of objects in the water or in the mirror, the shadow theatre, and the camera obscura. The mirror in particular holds a special place in culture as an object aiding introspection, contemplation, and self-knowledge, as well as encouraging self-delusion and related magical beliefs resulting from the indexical nature of the image reflected in the mirror. Interestingly, of all possible types of indexical representation the mirror reflection is perhaps closest to the thing it represents, not only because of its fully contiguous nature but also for optical reasons. Namely, a plane mirror sends to every eye the actual light flux which comes from the real scene. Consequently, what we see in the mirror is not just a reflection but reality itself: according to the physiologist Maurice H. Pirenne, “the mirror does not *represent* reality, it *presents* to us reality” (Pirenne 1970: 11). The ancients believed that the image in the mirror originated from physical contact, from an imprint made from the eye to the object through rays of light – which is why the mythical basilisk could be killed by its own poisonous stare reflected in the mirror (Melchior-Bonnet 2002: 103). The mirror also provides a unique case of fully contiguous visual communication not with another system but with oneself, including an otherwise unattainable, psychologically important opportunity to examine one’s face. As such, for self-conscious systems such as humans the mirror can be an instrument enhancing self-awareness, a sense of being unique and different from other systems in the environment. Incidentally, the ability to recognize the creature in the mirror as oneself is not confined to humans, but has been observed among other primates and, more controversially, in experiments with dolphins and elephants. While these animals are able to recognize themselves as

themselves in the mirror, other animals apparently see only a rival or a friend (Pendergrast 2003: 362–364).

The illusion of splitting or doubling of the object reflected in the mirror can also encourage beliefs in split personalities or immaterial souls existing separately from the body. The writer Sabine Melchior-Bonnet interprets the myth of Narcissus in terms of an archaic belief in the existence of a double, or of a soul taking a substance, a concept found in many traditional cultures (Melchior-Bonnet 2002: 102). In *The Golden Bough* Frazer recounts similar widespread folk beliefs in souls being captured in mirrors, with the resulting fear of losing one's soul when looking at one's reflection in the water (Frazer 2002: 357). A corresponding, equally popular belief is that breaking a mirror will cause someone's death or bring bad luck. In ancient Greece, just looking at one's reflection, the "soul" captured in the mirror, could invite death, as the myth of Narcissus famously illustrates.

At the same time looking intensely into a mirror or some other reflective surface was widely believed to encourage contemplation, introspection, and mystical insight. In ancient and medieval times scryers (gazers into reflective surfaces) peered into mirrors, crystals, waters, or polished metal to allegedly gain supernatural knowledge. Roman scryers were called *specularii*, after *speculum*, the Latin for "mirror." Both words stem from *specere*, "to look," as in *speculation*. As Mark Pendergrast shows in his fascinating account of the cultural history of the mirror, all cultures on record believed in scrying and had some sort of magic beliefs and practices associated with mirrors (Pendergrast 2003: 29–52). In the Christian Middle Ages, for example, scrying was sufficiently popular to be officially condemned in numerous treaties of demonology, which spoke of such reprehensible magical practices as hydromancy (divination by water), catoptromancy (by mirrors), and crystallomancy (by crystal balls). In his *Polycraticus* (1159) John of Salisbury went as far as to attack all polished and brilliant objects, from blades of daggers to polished fingernails and metal. Experiments conducted today reveal that the mirror's reflection can trigger a hypnosis or trance, if gazed at for a sufficiently long time. In the Middle Ages such hypnotic visions were seen as communications with the devil, which is why the Church condemned all experiments and magical practices using mirrors (Melchior-Bonnet 2002: 188).

The images created by mirrors, the camera obscura, or by live performances and rituals are fully contiguous with originals, the fact that also limits the social range of these communicative devices, as contiguous images can only be perceived by viewers present within the same spatio-temporal context. Only a few people can simultaneously see their reflections in the same mirror, or an image of a city in one camera obscura, just as only so many people can witness a single live theatrical performance, a musical concert, or a sports event, compared with a potentially unlimited number of people able to see the same events later, by means of

spatio-temporally displaced iconic indexes of film. To allow a mass audience scattered in different places to experience the same event at the time of its happening other communication devices had to be invented, and were: they are radio and television. In semiotic terms live radio broadcast, similarly to the telephone, communicates spatially displaced, simultaneous auditory indexes, whereas live television communicates both the above and spatially displaced, simultaneous animated iconic indexes.

Contiguous experience and the birth of television

Compared with the mirror, the function of painting, photography, and film is to provide temporally displaced rather than contiguous visual representations. The awareness of this particular limitation of photography, of its inability to communicate what happens here and now, probably lay behind the invention of the Polaroid camera in 1947, which created a sensation by being capable of developing and producing a finished print in just a few seconds, almost simultaneously with the photographed event. The camera's ability to produce near-contiguous images was perceived as attractive enough to counterbalance such disadvantages as its bulky size, greater weight, and a much higher price as compared with an ordinary camera (Freund 1980: 205). Today the near-contiguous photographic images are produced cheaply and in abundance by digital cameras equipped with little LCD (Liquid Crystal Display) screens, capable of showing pictures taken just seconds earlier. In this sense digital cameras can be seen as (almost) bringing together the function of traditional photography with that of the mirror: a paradoxical combination of temporal displacement and simultaneity.

The unattainable paradox of obliterating the difference between the present and the past, in other words, of "stopping" the passage of time, underlies Oscar Wilde's brilliant visualization of the relations between life (contiguous events) and art (displaced fixed icons) in the form of a painted portrait which supernaturally exchanges properties with its subject, the beautiful young man Dorian Gray (Wilde 1994: 46). As a result of this exchange, the man in the painting wanes and grows old and ugly with time, while the living equivalent retains his youth and physical beauty despite the passage of many years. In another magical paradox, the normally iconic painted portrait becomes an indexical mirror reflecting, through the increasing ugliness of facial features, the moral decline of the man represented in the painting. The portrait of Dorian Gray is Wilde's version of the dream of eternal youth, a manifestation of human paradoxical desire to combine the much wished-for timelessness with the objectively unstoppable passage of time: to freeze the contiguous moment by transforming it, magically, into a temporally displaced

image that retains the effects of contiguity. In works of fiction, such as Wilde's novel or the myth of Faust, the impossible paradox can only be attained by breaking natural laws, which is probably why for didactic reasons both Dorian Gray and Faust are punished for their "unnatural" wishes.

What the magical portrait of Dorian Gray and live television have in common is that both are instances of spatially displaced but simultaneous iconic indexes. The feature that distinguishes "typical" television from other visual media such as photography or film is precisely the ability of the former to provide many geographically scattered viewers with images that are simultaneous with the represented events. As a temporally contiguous medium live television has thus more in common with the old camera obscura than with film. Indeed, when television was invented in the late 1920s its images, of very poor quality when compared with photography or cinema pictures, caused a thrill precisely because of the new medium's power of contiguity: its ability to transmit simultaneously images of spatially displaced events to many viewers. Contiguity was the one dimension lacking in the otherwise perceptually and cognitively attractive photographic indexicality of moving pictures. As the historian of mass media Peter Kramer has pointed out, from its inception in the late nineteenth century cinema was caught up in the television imagination – a vision of the important events taking place around the world being made available to everyone in the privacy of their homes, by means of the technologies of sound and image reproduction capable of transmitting events at the time or shortly after they were happening (Kramer 2000: 39).

Television that is, "seeing at a distance" or, in semiotic terms, providing spatially displaced but simultaneous animated iconic indexes, had been a human dream long before the medium was actually invented. In 1879 George du Maurier drew a cartoon for *Punch* showing a mother and father watching, on the wall of their English home, a tennis match in Ceylon in which their daughter was playing. The parents were also able to speak to her over as yet uninvented long-distance telephone (Wheen 1985: 12). Before John Logie Baird's first public demonstration of television in London in 1926, experiments with capturing simultaneous images, using a combination of photo camera and a device to convert light into electric impulses, were conducted in late nineteenth century in Germany, Russia, and the United States. The most important of these devices was an electronic cathode-ray tube, invented by a German called Karl Braun, in which the image could be picked up on a thin plate coated with a photosensitive substance. The plate would be bombarded with electrons from a "gun" at the end of the tube. This fusillade, sweeping from side to side and up and down, would provide electrical impulses matching the image being received on the plate – impulses which could then be transmitted by radio. At the other end of the apparatus, the image-receiver, that is,

a TV set, would convert the impulses back into a picture on a fluorescent screen (When 1985: 13).

Despite poor picture quality, the main advantage and thrill of early television was precisely its live transmission, which enabled distant viewers to witness the events occurring far away at the time of broadcast. It is interesting, but not surprising in view of human perceptual preferences, that the first ever experimental television transmissions conducted in Britain, Russia, and the USA included images of human faces rather than land- or cityscapes. Most of the early television programmes from the 1930s consisted of live broadcasts, while films, especially silent cartoon, were used only occasionally (Kramer 2000: 28). The first public demonstration of television in America, organized in 1927, was a live broadcast from Washington and watched in New York, which contained a speech by Herbert Hoover, US Secretary of Commerce, and a show featuring a comedian A. Dolan, the first television entertainer. The *New York Times* emphasized on that occasion the importance of television to bring “news-reels flashed before audiences at the moment of occurrence, together with dramatic and musical acts shot on the ether waves in sound and picture at the instant they are taking place in the studio” (When 1985: 16, 20). Unlike the cinema, better suited to convey dramatic visual narratives relating to actual or fictitious events spatio-temporally displaced from the viewers’ experience, television was from its inception perceived as a visual extension of the radio, broadcasting “news,” that is, showing images of real events at the time their occurrence, or reported verbally live as soon as possible after they happened.

Actuality and topicality, and whenever possible live transmission of events thus became the defining features of early television, and to a large extent have remained so to this day. The first regular television broadcasting service in the world started in Germany in March 1935, sixteen months before BBC Television. Dr Goebbels, Germany’s Minister for Propaganda, was said to be very interested in television as a means of promoting Nazism, although the Führer himself never spoke live from a television studio. Largely due to the cumbersomeness of early television equipment and the resulting problems with mobility, most of the early programmes did not present events live but as soon as possible afterwards on film as newsreels and short documentaries. Early German television broadcasts also included half-hour extracts from feature films, as well as a regular show called *Mirror of the Day*, which was shot in the streets of Berlin by a mobile unit. As television sets could not be bought in the shops, anyone who wished to see these programmes had to go to one of Berlin’s eleven public viewing rooms, which were run by the Reichspost. Berlin also had a “tele-cinema” with a large screen, four feet by three. In 1936 Germany staged the most ambitious outside live broadcast in the world – the Berlin Olympics. As many as three cameras covered the event, placed in the stadium, the gymnasium, and the swimming pool. The audience of these

broadcasts, watching in the public viewing rooms, was estimated to be as high as 150,000 (Wheen 1985: 31).

In Britain the regular service of BBC Television started in August 1936, with a programme called *Here's Looking at You*, which introduced the “magic of television,” in the announcer’s words, to the general public. The “magic” consisted of previously filmed material, including a newsreel and a discussion about books with Rebecca West, T. S. Eliot, and Somerset Maugham, as well as a live variety show featuring a Chilean tap-dancing duo, a singing group, a comedy act, and a solo song, specially written for the broadcast. As in Germany, whenever important public events were planned, television cameras were on location to broadcast them live. In May 1937 television viewers could watch a direct transmission of the coronation of George VI, and in 1938 the public could witness live Neville Chamberlain’s arrival at Heston Airport from Munich, waving a piece of paper which Hitler had signed, a supposed guarantee of peace. In September 1939, before TV broadcasting was stopped with the outbreak of World War II, about 20,000 people in Britain owned sets (Wheen 1985: 25, 34).

Television today – contiguity still reigns supreme

Despite the fact that the golden age of live television broadcasting in Europe and the USA, the 1950s, has long been over, media critics argue that “liveness” still remains the defining feature of television and a fundamental part of the viewers’ expectations. Television broadcasts are still associated in public perception with “authenticity” and “truth,” qualities not expected in fiction films screened in cinemas or on television (Bourdon 2004: 182). As the film critic Charles Barr puts it, “if there isn’t this intermediate process, and time gap, between capturing the image and showing it, then this is not what we call cinema. Television, in contrast, was developed as a device for capturing and showing images simultaneously, or virtually so: images of the present, not of the (distant or recent) past” (Barr 2000: 53). Even when television produced its own films in the pioneer pre-war years it was, paradoxically, in order to simulate the record of a live transmission – they were repeats or reconstructions before a film camera of what had originally gone out live. Direct transmission was thus seen as television’s dominant mode, especially in view of the fact that initially there was no way of recording the TV camera’s own directly-transmitted images either on film or on tape. Despite its visual mode, which television shared with film, the medium had more affinity with radio – an auditory medium likewise broadcasting live, that is, simultaneous if spatially displaced indexical signs (Barr 2000: 57).

Thus both in the early days of television and today, the most popular programmes remain live broadcasts of news, major weekly prime-time variety shows, reality TV, and major sports events – this despite the fact that news reports for example are in fact made of edited visual material referring not to simultaneous but to recent events. In the age of private video and DVD collections of fiction films, and with a competition for the viewers' attention from television drama and vintage cinema, polls show that most people still prefer to watch TV news and "live" reality programmes: chat shows, game, quiz and dating shows, as well as surveillance, voyeuristic productions such as *Big Brother*. As with news and sports programmes, however, the "reality" of these shows is really a misnomer, because the format of these programmes is designed by producers, who in fact create a completely fabricated world, with carefully prepared scenarios and settings to provoke in what looks like "real time" particular behaviours in invited, non-professional participants. According to media critic Jérôme Bourdon, liveness is unlikely to disappear from television, and indeed the present tendency is towards extending news programmes to cover global events, as evidenced by the popular CNN and BBC World channels. Non-stop television news channels have opened in many countries (France, Germany, Italy), and similar broadcasts are planned in other countries. Studying remote control switching patterns also reveals that even the viewers watching other programmes such as films, television drama, documentaries and sport, regularly check up the news channels with their live broadcasts of current or recent events (Bourdon 2004: 193).

As media critics have also observed, the principles of simultaneity and liveness are extended in television even to types of programmes historically inspired by film drama, such as sitcoms and soap operas, that is, fictional entertainment shows not designed to communicate news or show actual recent events. A typical television drama show achieves the effect of liveness first of all by a contemporary setting, and by being concerned with every-day human action. According to the critic John Fiske, contemporary, every-day realism is particularly suitable for television, because its audiences are wider and more random than the statistically narrower, selective viewers of theatre or cinema shows. The small screen and comparatively poor definition of television also lead it to concentrate on mid-shots and close-ups of people talking and interacting, rather than on wide views of open spaces. The repetitiveness of series television programmes and their origins in studios rather than on exterior locations result in shows that rely on familiar interior settings of a domestic scale such as the home or a pub frequented by the same, socially closely integrated people. Also, despite the inevitable time gap between production and transmission, television drama constantly promotes the impression of "nowness," the sense of being always "live." While film undisguisedly

presents itself as a record of what has happened, television insists on presenting itself as a relay of what is happening (Fiske 1987: 22, 273).

In television drama contiguity determines for example the temporal structure of individual episodes, so organized as to resemble continuous, real time of the viewers as much as possible. Sitcoms and soap operas are not broadcast live of course, but they are often recorded in front of a live studio audience as a more or less continuous show, as in the theatre. The episodes are usually shot with multiple cameras, and unlike film they have limited or no post-production editing. The effect of this mode of production is that the time taken to perform an action on television coincides precisely with the time taken to perform it in “real life,” with many “dead moments” in the middle of the action which cannot be edited out as they are routinely in film. This absence of editorial intervention adds subtly to the sense of realism, with the camera merely recording what happened, creating a sense of liveness, an illusion that the action is happening “now.” Even when recorded weeks in advance, in the perception of television viewers drama programmes still take place “today” by observing the unity of time, as in ancient Greek tragedy whose action was limited to one day, as close as possible to the viewers’ perception of a natural flow of time, with minimum omissions or jumps forward. Soap operas, like the BBC *Coronation Street*, the longest-running and still the most popular of British television dramas, all observe in a residual way the convention of both live theatre and live television. For instance, editing allows actors “time” to change clothes, or to move from set to set, with time and space management that preserves the effect of continuity and “real time” – a single day compressed to a half-hour show. By contrast, film viewers accept as “normal” time jumps and frequent changes of location from shot to shot – spacio-temporal displacements difficult to tolerate in television drama and frequently perceived as “unnatural” (Barr 2000: 70).

Contiguity goes global

The preference for contiguous or near-contiguous communication, even with sender and receiver separated by distance, remains therefore a default state in human interactions with the outside world, mainly because of our evolutionary baggage which predisposes us primarily towards direct, face-to-face interactions with other people and elements of the environment. Whenever possible therefore, even indirect, technologically mediated communication remains in the service of the social need for contiguous exchange of information between spatially separated communicators, as was the case with the early telegraph or the telephone, and even more so with today’s mobile phones, text messaging, and electronic mail, which allow for practically instantaneous two-way, individual simultaneous

communication across the globe. In the sphere of the public media traditional television still remains the main channel of communicating globally near-contiguous news, despite the competition since the early 1990s from the new, digital medium of mass communication, the Internet and its child the World Wide Web.

Launched in 1991, the Internet combined the already existing media, such as the printed text and photography, in more recent years supplemented by digital video, recorded music and television, eventually creating what has been termed as “cyberspace,” the “virtual world,” and the “network society.” Technically, the Internet constitutes the electronic network of networks that link people and information through personal computers, and allow both for interpersonal communication (via e-mail) and public information retrieval (via Internet sites). Internet usage thus involves person-to-person communication, group communication, and global publishing and information provision, via electronic mail, news groups, chat rooms, mailing lists, and the World Wide Web. The latter allows for the display of colourful pictures, music and audio, as well as data and text, utilizing the hypertext principle, in which links from one information source provide easy point-and-click access to related information available from other sources. Compared with the traditional mass media such as the press, radio, or television, the Internet offers several communicative advantages, including freedom and personal control in accessing information from multiple sources, as well as greater degree of interactiveness and anonymity, which reduce the barriers to participation based upon gender, age, race, social class, nationality, disability, or economic status. Other communicative advantages include the exponential growth of both people and information shared through the network, the ability to quickly access multiple and interconnected information sources through the hypertext Web structure, and the ability to continuously update the available information, especially the current news (Flew 2002: 16). With well over a billion (23,5 per cent of world population) of Internet users estimated in 2009, the World Wide Web could soon replace television as the chief mass provider of current news, as a means of interpersonal communication, and a source of social, historical, and scientific information – all available cheaply and democratically to all literate users around the world (www.internetworldstats.com/stats.htm).

One of the buzz words of today is “globalization,” denoting a process of pan-national, round-the-world integration of trade and culture, which in practice means free and unlimited exchange of information, mainly via the Internet. The benefits of thus understood globalization may be unevenly distributed among the participating nations, which is why the trend towards global economic integration has both ardent supporter and vehement opponents. The erosion of local, indigenous cultures, and curtailment of economic and political independence that globalization can bring to some nations are among the reasons why the process is

contested in some quarters, with the film critic Michael Gove for example commenting that “globalization may make it easier for peoples to encounter new cultures, but it makes the journey less worthwhile as individual cultures become more like each other” (Briggs and Burke 2005: 257). The need to protect national cultures is one of the reasons why some people would wish to curb, if not to halt globalization, but what the opponents of globalization often fail to realize is that trade and other forms of social exchange (personal contacts, tourism, cultural cross-fertilization and so on) are probably the most effective ways of reducing tensions and possible violence among individual people and nations. With expanding networks of reciprocity and the lifting of economic and political isolation, people all over the world are more likely to treat people of different cultures and races as fellow human beings worthy of respect and friendship, rather than as “alien” or “inferior.” As the journalist Robert Wright put it: “Among the many reasons I don’t think we should bomb the Japanese is that they built my minivan” (Wright 1995: 87). Global trade, even with countries one has never visited and with people one has never met, induces positive, tolerant, and mutually respectful attitudes in international relations, both on official political level and in popular perception. On purely economic level globalization, with its inherent reciprocity of exchange, increases material prosperity both for developed and developing countries, enhances civil liberties, and leads to a more just and efficient allocation of resources. On the other hand isolation deepens the existing economic differences, breeds ignorance and prejudice about foreign cultures and people, inducing distrust, suspicion, or downright demonization and irrational fear of “the Other.”

We also must not forget that global technology and computerization in particular played an important part in dismantling the totalitarian structures of communism. For instance, in 1980–1 the Soviet authorities introduced cheap efficient TV aerials so that everyone could watch the expected Soviet triumphs in the Olympic Games in Moscow. Instead, everyone in the western parts of the USSR found that by turning their aerials round 180 degrees they could pick up the uniquely uncensored programmes from Poland which the independent trade union Solidarity had briefly succeeded in wresting from the state-run television. More recently the Chinese authorities have learned similar lessons through the spread of personal computers, despite the state’s attempts to limit the freedom of the Internet (Davies 2007: 280). Global technology and communication mean that totalitarian political systems are on their way out and are not likely to return, at least not in their familiar form.

CHAPTER 7

From mimicry to metaphor

The origins of art

As I argued in the previous chapters, photography and painting can be regarded as paradigmatic examples of indexical and iconic types of visual representation respectively. A photograph, like a footprint or odour, is produced (often unintentionally) by the sender (the photographed object), with which the photograph maintains a direct, physical and causal if temporally removed relationship. This physical connection at origin is responsible for what can be described as an irrational psychological response elicited by index, when it is identified (as in contagious magic) with the object that produced the index. On the other hand a representational painting is produced fully intentionally by the receiver (the painter), and like all icons it has no physical, causal relationship with the represented object, which may or may not even exist objectively (Peirce 1998: 143; Greenlee 1973: 70). The only real connection between icon and the object it represents is indirect and mental, and any beliefs as to the alleged physical link between the two underlie, as we have seen, homeopathic magic which like all magic offers a subjectively compelling but objectively false description and interpretation of reality.

Iconicity in animal communication

Probably less powerful in their emotive response than indexes, icons are nonetheless ubiquitous in human communication, mainly because they result from certain basic perceptual and cognitive mechanisms which, incidentally, humans share with the rest of animals. Exchanging information with the environment begins with perception which, as defined by Derek Denton, relies on discriminating an object or event through one or more sensory modalities; in other words, on separating an object from the background (something is picked out). A stimulus thus perceived is then subject to cognitive processing, which includes categorization, when non-identical objects or events are treated as equivalent on the basis of selected categories, that is, elements common to the objects. Categorization then leads to generalization, when different perceptual categories are combined to construct a concept, or a “universal” (Denton 2005: 102). As the cognitive anthropologist

Pascal Boyer also points out, a concept results from the recognition of a certain generalized similarity, when different singular objects are mentally related because they share some property or properties (Boyer 1994: 62; Nöth 2001: 25). For example, the concept of a “car” brings together different objects that share certain observable characteristics: a large (relative to the human body), laterally symmetrical box-like shape, four wheels on which the car is rolling, a steering wheel, seats for the driver and passengers, the capacity of self-propelled movement under the driver’s control and so on. The more abstract concept of “friendship” on the other hand denotes various behaviours and mental states that share less physically perceptible but still psychologically identifiable properties such as companionship, reliability, trust, understanding, willingness to help and so on. Concepts thus formed are building blocks out of which instinctive as well as conscious knowledge is constructed; they are generalized mental representations of the relevant elements of the outside world (Boyer 1994: 67; Deacon 1997: 71, 77). For instance, the sea gulls appear to have an innate generalized concept of an egg, which does not just refer to their own specific eggs, but it extends to all egg-like objects. If an egg is removed by an experimenter from the sea gull’s nest and put nearby, the gull will retrieve it. It will also retrieve other round objects – pebbles or potatoes, if they are sufficiently close in shape and touch to the egg – but it will leave angular and soft shapes untouched. For the gull, the concept of an egg is apparently larger than the class of eggs, and includes other similar, egg-like objects (Gombrich 2003: 86). For similar reasons fish react to dummies of worms used by anglers as if they were real worms. Animals, in other words, are instinctively able to perceive similarity, or structural equivalency, between an external object and a concept existing a priori in their nervous systems.

The principle of generalized similarity as the basis of iconicity plays a paramount role in animal communication, and involves all the available sensory channels: chemical (olfactory and gustatory), auditory, and visual. The iconic function of the chemical signal, for example, is illustrated by the alarm substance used by the ant *Pogonomyrmex badius*: if the danger to the colony is momentary, the signal – a quantum of released pheromone – quickly fades and leaves the bulk of the colony undisturbed. If however the danger persists, the substance spreads proportionately, involving an ever-increasing number of workers. The chemical signal is iconic inasmuch as its intensity and duration vary in analogous proportion to the waxing or waning of the danger stimuli (Sebeok 1994: 30). Chemical signals used by insects can also be iconic in relation to another adaptively important function – nourishment. The intensity of insect odour trails laid by successful foragers in various species of ants depends directly on the amount and quality of the source of food. Here the pheromone acts as an iconic signal inasmuch as it relates in analogous fashion to the increase and decrease of the guiding odour spots. A particularly

impressive example of iconicity in animal communication in relation to food is the dance language of honeybees, as revealed by the classic experiments conducted by Karl von Frisch in the 1940s. Within the honeybees dance language important information is conveyed about the distance to food, its location, and its quality. The informational channel encompasses four sensory modalities: visual, auditory, olfactory, and tactile. The dance system requires first the ability to encode in the dance the information about the distance and direction of the flight to food. Secondly, hive mates must have developed the perceptual and cognitive capacity to interpret motor patterns associated with the dance, and to use such patterns to narrow their own foraging paths.

In von Frisch's experiment food was placed at different distances from the hive, and then the waggle dance of returning foragers was quantified. Results showed a negative correlation between the number of turns in the waggle dance and distance to the food source, such that distant foods were associated with relatively longer dances (fewer turns) (Hauser 1998: 497). In other words, the number of turns in the waggle dance served as an iconic signal communicating the information necessary to return to the discovered source of food. What is truly impressive about the honeybees' waggle dance is that these extremely small creatures, with their relatively simple nervous systems, are able to communicate quite explicit information about the distance, direction, and location of food, and also that the communicated information refers to objects (food source) that are to some degree displaced in space and time, the fact that indicates the presence of specialized short-term working memory in the honeybees' small brains. Still, the honeybees use their elaborate communication system to talk only about one thing: food. In this sense, they appear to be more limited than other nonhuman animals.

Genetically programmed iconicity also plays a pivotal role in deception practised by animals, involving smell and taste, colour and shape, sound and behaviour. Sometimes an insect even alters its surroundings to fit its own image, by fabricating a number of dummy copies (icons) of itself to misdirect predators away from its body, the live original, to one of several iconic replicas it constructs for that very purpose (Sebeok 1994: 84; Brandon and Hornstein 1986: 171). Deceptive fabrication is here designed to create an icon closely resembling the original object to elicit in another organism the same kind of response. A more familiar term for iconic deception practised by living organisms is mimicry, that is, a naturally selected resemblance between two or more animals or plants (Hinton 1973: 99). For example, bee orchids induce bees to copulate with their flowers because of their strong resemblance to female bees. What the orchid has to gain from this deception is pollination, for a bee which is fooled by two orchids will incidentally carry pollen from one to the other (Dawkins 2006a: 65). Among the more impressive examples of animal mimicry, or deceptive iconic communication, are spiders

mimicking ants they prey on: one spider species can even carry a dead ant, mimicking an ant carrying another ant to look innocuous to its prey. The larva of a South American hawk moth, *Leucorhampha*, mimics a snake, while the bug *Fulgora lucifera* from Brazil has the head resembling that of an alligator. The bug can apparently scare off a bird or monkey approaching near enough to resolve the features of the head (Hinton 1973: 112, 121). The angler fish attracts its prey by means of a lure – a wriggling, worm-like piece of flesh on the end of a long “fishing rod” projecting from the top of the head. When a small prey fish comes near, the angler will dance its worm-like bait in front of a little fish, and lure it down to the region of the angler’s own concealed mouth. Then it suddenly opens its jaws, and the little fish is sucked in and eaten (Dawkins 2006a: 64; Allen and Sidel 1998: 193). The angler fish is using iconic deception, exploiting the little fish’s generalized concept of the “worm,” which makes it approach all wriggling worm-like objects as if they were real worms.

These and countless other instances of mimicry among plants and animals show that iconic communication, far from being an exclusively human domain, is possible in the absence of conscious intentionality. As Richard Dawkins explains, animal or plant mimicry is a result of natural selection, which in certain ecological situations increases the survival of organisms that resort to mimicry, as when a harmless and edible species mimics a harmful non-edible species to avoid being eaten. For instance, some unusually brightly coloured butterflies taste nasty, and birds learn to avoid them by their “warning” marks. Now other species of butterfly that do not taste nasty mimic the nasty ones in their appearance (although not in taste). They frequently fool human naturalists as well as birds. A bird which has once tasted a genuinely nasty butterfly tends to avoid all butterflies that look the same, including the mimics. In this way genes for mimicry are favoured by natural selection (Dawkins 2006a: 31). Animal mimicry is an example of the type of deception defined in Chapter 2 as substitution, combining suppression and fabrication, when a system manipulates the receiver into accepting meaningless information in the place of meaningful information. On the other hand the type of deception defined earlier as suppression is often found in the animal kingdom in the form of camouflage, or crypsis, as when a caterpillar “hides” from potential predators by developing a resemblance to an inedible dead twig. Suppression thus occurs when a system purposefully fails to communicate meaningful information. While in mimicry the prey is seen but not distinguished by the predator from something inedible, in camouflage the prey is not seen at all (or is seen but not distinguished from its background) (Hinton 1973: 100).

From mimicry to imitation

When we say that something is iconic of something else we usually mean that there exists a structural equivalence, a perceived resemblance between otherwise different objects. As we have seen, the perception of that resemblance among animals is either genetically programmed and automatic, or learned as a conditioned reflex, as in the case of birds that learn to avoid brightly coloured butterflies. The cognitive process that generates iconic reference is what is literally meant by the term “recognition” (“re-cognition”), in applying an a priori existing concept of an object onto the perceived object whose appearance corresponds in some measure with the concept. Iconic recognition in the form of camouflage and mimicry is thus widespread in animal perception of their environment, just as it is ubiquitous in human cognition – so much so that it is usually simply taken for granted as the basic perceptual automatism underling both our innate and learned responses to environment. For Terrence Deacon, as earlier for Peirce, iconic representation lies at “the bottom of the interpretive hierarchy,” as “the base on which all other forms of representation are built” (Deacon 1977: 77). On top of this automatic iconic (re-)cognition the meta-thinking humans also have at their disposal other, more advanced cognitive faculties linked to reflexive consciousness, the extended working memory, and the resulting perception of the flow of time. While animal iconic communication is rigidly programmed by the genes and refers to a few adaptively important contiguous situations, the cognitively more fluid humans use iconic recognition to code consciously observed and remembered knowledge about the world both in material artefacts such as tools and works of art, and in language. In this way in the course of human evolution instinctive mimicry has given rise to conscious imitation, and later to metainformational mimesis, as in representational art, which codes information referring to objects and events displaced in space and time.

Imitation is one of the most basic and relatively unsophisticated ways of learning new things, especially practical skills, but it still requires the human-type consciousness and extended working memory that for example the apes, our nearest animal cousins, appear to lack. The verb “to ape,” describing mindless copying, is actually misleading, because the apes are not really good at imitating behaviour: humans are much better at aping than the apes themselves. In fact, some primatologists argue that even chimpanzees, the highest apes, cannot imitate – all that happens is that their attention is drawn to certain objects and then learning takes place on a trial-and-error basis (Mithen 1999a: 77). The apes’ inability to imitate objects, actions, or behaviours explains why they cannot produce iconic, pictorial representations, even in experimental conditions. The psychologist Desmond Morris presents the results of research with chimpanzees, gorillas, orang-utans,

and capuchin monkeys producing drawings and paintings. During research the animals received no assistance or guidance from the experimenters, except for the provision of and familiarization with the drawing or painting equipment. The animals received no reward for picture-making, and the response was – reports Morris – not only self-rewarding but very powerful in many cases. Some of the chimpanzees produced between 200 and 400 pictures. The painting techniques included a tendency to fill a blank page, but not to scribble outside it; a tendency to mark a central figure; a tendency to balance an offset figure; a tendency to become calligraphically bolder as time went on, starting with simple lines and changing them into multiple scribbles. However, no ape has been able to develop graphically to the pictorial stage of even the simplest representation. While clearly in possession of primary representations of the world around them (the concepts corresponding iconically with the familiar objects and situations), the apes are incapable of remembering and reproducing these concepts in displaced secondary representations such as those found universally in human art. As Morris' experiments have revealed, drawing and painting are for the apes a form of play – a self-rewarding activity that unleashes surplus nervous energy, keeping the animal mentally and physically healthy, probably not unlike the sensations felt by modern, Jackson Pollock-style artists producing their abstract paintings (Morris 1962: 141).

Conscious imitation (in contrast to animal mimicry acquired through natural selection) appears therefore to be limited to humans. It is an important cognitive adaptation enabling humans to learn quickly and accurately new, non-genetically transmitted knowledge and skills, and as such it is an essential component of the development of culture (Workman and Reader 2004: 358, 369). In this the human capacity to imitate is fundamentally, if not uniquely different from what has been observed in all other animals, including other primates. As said above, nonhuman primates raised under natural conditions have provided no convincing evidence of imitation. At the same time imitation is probably the most powerful pre-linguistic learning mechanism among humans, because it enables individuals to accurately reproduce a particular motor action in the absence of a demonstrator (Hauser 1998: 650). Imitation thus understood is clearly a function of extended working memory: to imitate means to be able to perceive a motor action, store it as a mental representation, and then repeat the motor act observed in the absence of the original performer. It is the basic mechanism of transmitting new information rapidly and faithfully within a human population. Culture understood as a non-genetic transmission of knowledge is therefore only possible in organisms that exhibit an imitative capacity based on memory. According to Marc D. Hauser, even before the appearance of syntactic speech imitation must have represented a fundamental step in cognitive sophistication, one with far-reaching implications for human culture and communicative faculties (Hauser 1998: 651).

Mimetic culture

According to Merlin Donald the modern human mind evolved from the primate mind through a series of major adaptations, each of which led to the emergence of a new representational system. Donald argues that each successive representational system has remained intact within our current mental architecture, so that the modern mind is a mosaic structure of cognitive vestiges from earlier stages of human phylogenesis (Donald 1991: 2; 2001: 3–15). First in his evolutionary model of culture Donald includes what he calls “episodic culture,” which humans inherited from their ape ancestors, and which in my classification of types of communication appears to correspond with contiguous interactions with the environment. Episodic culture (if “culture” is indeed the appropriate term) relied on direct communication with the environment, in which symptomatic representations of body language and emotive vocalizations were verified with direct reference to adaptively relevant objects and events (which meant that episodic culture did not involve spatio-temporally displaced referents). The fixation on contiguous stimuli and absence of collective memory also meant that the episodic culture of our ancestors showed a very slow rate of change: it took *Homo erectus* (1.8 million–300,000 years ago) half a million years to domesticate fire, and three-quarters of a million years to adapt to colder climates (Donald 1991: 210).

The first major transition, according to Donald, introduced what he calls “mimetic culture,” characteristic for late *Homo erectus*. In Donald’s view mimesis (or imitation in my sense) offered the first if primitive form of displaced representation, still tied closely to concrete, episodic culture. It did not, as far as archaeological record can tell, involve the invention of iconic artistic artefacts, still less of arbitrary symbols. The mimetic representation involved mostly bodily signals and emotive vocalizations of the kind discussed in Chapter 4 as delayed, that is, already displaced reactions to or re-enactments of adaptively important events: emotions such as triumph or anger expressed immediately after the event through postures, facial expressions, gestures, and sounds mimicking the event.

Despite the advantage of referential displacement, mimetic culture was in many respects a less efficient form of representation than the later syntactic, symbolic language (see Chapter 10), because it was slow-moving, ambiguous, still restricted to a concrete event or specific subject matter, and conservative. But even with these limitations iconic, imitative representations did contribute to the spread of practical skills such as tool production. Iconic representations can in fact be even more efficient than symbolic language in diffusing certain kinds of knowledge, as in modelling social roles, communicating emotions, and transmitting rudimentary skills used in crafts. This is why it is easier to teach someone how to set an animal trap or how to make a flint axe through visual demonstration than through purely

verbal instruction. For the same reason it is easier to learn how to operate computer programmes such as Word by using small icons displayed on the screen, rather than by learning arbitrary mathematical codes or by following linguistic commands (Barker 2000: 15). The iconic signs we click on or drag across the computer screen visually resemble the functions they control, and their use requires quick and easy learning based largely on innate perceptive automatisms rather than on symbolic codes requiring concentrated and conscious mental effort.

Iconic, visual instructions and demonstrations are still used today in situations in which safety or survival depend on the speed and accuracy in communicating relevant information, as in leaflets and cards familiar to us from air travels, which contain pictorial instructions about what to do in an emergency. The understanding of these images is no doubt vastly facilitated by the addition of verbal explanations, and even more so by live, visual demonstrations by cabin personnel, but verbal, that is, symbolic explanation alone would not be as efficient in communicating certain practical instructions quickly and accurately. In pictorial instructions words are kept to the minimum, not only for the benefit of people unfamiliar with the language but also because iconic instruction, through pictures or better still through live, bodily and gestural demonstration, is didactically more efficient, because based on more archaic perceptive and cognitive predispositions. Ernst H. Gombrich sums up the problem commonsensically: "In real life, the performance of a particular task is usually learned by imitation and trial and error. You are shown how to ride a bicycle and then you try it until you get the hang of it. Whether you can verbalize, let alone illustrate, the necessary movements is another matter" (Gombrich 1999: 229). According to Merlin Donald, mimetic skills led to a variety of important social structures, including a collectively held model of the society itself. They also provided a new vehicle for social control and coordination, as well as the cognitive underpinnings of pedagogical skills, especially those related to tool making, hunting and crafts. Mimetic culture was a successful and stable adaptation, a communicative survival strategy for hominids that endured over a million years (Donald 1991: 198).

Steven Mithen also stresses that imitative skills have been a key ingredient of culture throughout history, as evidenced today by children, who are spontaneously apt at imitating the behaviour of others. Early human hunters would similarly act out the roles of animals, mimicking their sounds and movements. Performing mimes of animals is pervasive among modern hunter-gatherers as part of their hunting practices and religious rituals. As has been observed, hunter-gatherers stalk their game in silence, and visual mimicry is often the only effective way of communication (in addition to conventional, arbitrary or partly iconic signs made with the hands for example) (Mithen 2005: 168). People can be mimicked as well

as animals, as in fighting or sporting pantomimes, still used in martial arts and by boys pretending to be David Beckhams on a football field.

As I demonstrated in Chapter 4, early indexical culture was focused on the human body and its modifications and adornments. It can be speculated that early iconic, or mimetic culture was likewise focused primarily on the human body, now used as an instrument to imitate, through ritual pantomime, other people, animals, inanimate elements of the natural environment, and possibly supernatural beings. The body-based iconic culture could lead in time to conceptual anthropomorphization of the entire world, including the cosmos, a feature attested in probably all archaic cultures. Ascribing mental states to inanimate objects, as in believing that trees, springs, rocks hills and so on have spirits, is one of the remarkable characteristics of the human mind (Dunbar 2005: 53). Modern humans (*Homo sapiens*, from about 170,000 years ago) universally reason about the natural world as if it were a social being. For example, a hunting-gathering tribe of the Mbuti in Zaire conceive of the forest as “parent,” and as a “giving” environment. The landscapes of modern hunter-gatherers do not consist merely of animals, plants, trees, rivers, rocks and caves: they are socially constructed through personification of all non-human environmental features. In this way the natural, social, and psychological domains became intimately connected by a system of analogies based on the human body and cognition, the phenomenon that Steven Mithen interprets in terms of human cognitive fluidity, which enables our species to integrate mental modules from different experiential domains, here social life and natural history (Mithen 1999a: 47, 49, 166).

From imitation to mimesis

What distinguishes *Homo sapiens* from other primate species is not only the ability to imitate and to think in terms of resemblances and analogies, but even more so the faculty of consciousness based on extended working memory. All animals are capable of generating primary representations of the part of the environment available to them, and possess what the psychologist Gerald Edelman calls “primary consciousness” – a state of being aware of things in the world, of having mental images cued in to the present, but without any sense of past or future. Humans are the only species to have at their disposal what Edelman calls “higher-order consciousness,” or what is referred to by psychologists and philosophers simply as “consciousness,” which involves the recognition of one’s own acts and affections, and embodies a model of the past and future as well as the present (Edelman 1992; Lewis-Williams 2004: 188). Thus understood consciousness enables us to use memory to fashion our own individual identities and mental “scenes”

of past, present, and future events, and to share those scenes socially both through language and through other forms of communication involving displaced referents such as permanent secondary iconic images, what we call art, as collective memory aids coding socially important knowledge about the world. From an adaptive viewpoint one would also predict that the first iconic artefacts should be focused on subject matter related to human survival: hunting, as the main source of highly nutritious food, and fertility, which is indeed what we find in the earliest visual art of our hunting-gathering ancestors.

The human higher-order consciousness is thus responsible for two things: the fact that – uniquely in the animal kingdom – we are capable of creating and communicating secondary images recorded on durable materials, and that these images, by virtue of their permanency, refer to objects and events displaced in time and space. The earliest attested art works come from Europe of the Upper Palaeolithic period (approximately 35,000–10,000 years ago), when modern humans still co-existed in the same environment with *Homo neanderthalensis*, the famed “Neanderthal Man,” a more primitive human species that did not make art and had a much simpler tool kit than their cognitively more advanced *Homo sapiens* (Lewis-Williams 2004: 39). It is by comparison with the Neanderthals that it is possible to appreciate fully the Upper Palaeolithic cultural revolution that the human higher-level consciousness was able to produce. As argued by the paleoethnologist David Lewis-Williams, the Neanderthals had at their disposal developed imitative skills, which placed them above the other primates, but they had no iconic or symbolic culture, which placed them below modern humans. They could use red ochre and a range of body adornments that they may have imitated after the *Homo sapiens*, which means that they possessed indexical culture based on ornamental extensions of their bodies, but they were not able, in the absence of higher-level consciousness, to imitate the permanent pictures and carvings produced by modern humans (Lewis-Williams 2004: 90).

An important archaeological index of fully human cognitive faculties is the presence of burials, as they presuppose an extended working memory, with the resulting concept of the future and the possible idea of an afterlife. Burial practices are among the human universals, and Steven Mithen assumes that the Neanderthals too buried their dead, at least some of them (Mithen 2005: 225). David Lewis-Williams is more cautious, arguing that the archaeological evidence for Neanderthal burial practices is often questionable. It is true that many Neanderthal skeletons have been found complete, which may indicate that they were deliberately placed in the ground and thus protected from human, animal, and physical factors that would otherwise have scattered the bones. Still, argues Lewis-Williams, the presence of articulated skeletons is not in itself a conclusive proof that Neanderthal burials were intentional, because certain natural depositional circumstances

can also produce the same effect. The evidence for Neanderthal grave goods, or “offerings,” is also “unquestionably weak” to Lewis-Williams. His sceptical conclusion is that “it seems likely that *some* comparatively late Neanderthals *may have* buried their dead, though there is little evidence in any of these burials to suggest ritual or religious beliefs; burial alone might have been done for hygienic reasons if people did not wish to abandon a rock shelter in which someone had died” (Lewis-Williams 2004: 81). Lewis-Williams’ scepticism is echoed by the archaeologist Iain Davidson, who likewise finds no evidence that any Neanderthals buried their dead (Davidson 2003: 154). This conclusion ties in logically with the apparent absence of fully human consciousness in the Neanderthals, which precludes cultural memory, including the notion of an afterlife or religion. Out of the question is also the spatio-temporal displacement of referents found abundantly in human iconic and linguistic communication. This means that even if the Neanderthals saw the cave paintings executed by humans, not only would they not understand what the images represented, but they most probably would not have been able to recognize them as “paintings” at all, or as anything distinct from the surface of the rock. For similar reasons (absence of consciousness and the inability to understand displaced reference) animals, with their stereoscopic, three-dimensional vision, are incapable of perceiving two-dimensional images such as paintings as representations of solid objects. The stories about sparrows coming to peck at the grapes painted by the Greek Zeuxis, designed to emphasize the life-like naturalism of the paintings, must otherwise remain purely anecdotal (Gombrich 1982: 286; Arnheim 1974: 136). Likewise, human syntactic speech would have sounded to the Neanderthals as purely emotive and iconic vocalizations, of the kind the Neanderthals themselves probably used, but the possibility that these vocalizations could refer to things not currently present in the speakers’ vicinity would simply not have occurred to them (Mithen 2005: 221, 226–228, 234).

The type of consciousness that the Neanderthals appear to have possessed was therefore different in important respects from that of the Upper Palaeolithic *Homo sapiens*, a difference that decisively precluded, for the Neanderthals, both image-making and elaborate burials. Because of the neurological structure of their brains and the type of consciousness that that structure allowed, the Neanderthals were unable to remember and entertain mental imagery, and were consequently unable to socialize and store that imagery in external artefacts, which is so fundamental to human culture. By contrast, the fully human higher-order consciousness, with its capacity for meta-thinking, includes the ability to entertain mental images, to generate mental images in various states of consciousness, from waking to visionary states, to recall those images, to discuss them with other people within an accepted ideological framework, and to make pictures of mental images in the form of permanent, material secondary representations coding the socially shared

knowledge of the world. The combined capacity for meta-thinking and the extended working memory also enabled early humans to plan actions with reference to abstract concepts not limited in time and space, a cognitive capacity likewise unavailable to the Neanderthals.

Once making permanent secondary images was cognitively possible, their production and use must have given their practitioners an evolutionary edge over ecological competitors such as the Neanderthals, who did not produce and use permanent images. The severe demands of hunting-gathering lifestyle of the Upper Palaeolithic probably did not allow for purely superfluous activities such as “art for art’s sake,” despite the “aesthetic” pleasure that creating and also looking at pictures must have produced, as even evidenced by the excitement experienced by the apes taught to draw and paint (Morris 1962: 141–145). The pleasure-principle involved in all artistic activities (in visual arts as well as in music) for producers and recipients alike can be viewed in terms of proximate and ultimate causes as distinguished by evolutionary science. The proximate cause motivates a particular action in an individual, usually through pleasant sensation, as in eating, socializing, having sex, playing or listening to music and so on. The ultimate causation on the other hand explains the innate character of the pleasure associated with these activities, which in our evolutionary past have increased the likelihood of human survival and procreation (Workman and Reader 2004: 2, 176). Ultimate causation thus generates the proximate causes, although among the conscious humans it is possible in certain circumstances to engage in pleasurable activities only for the sake of the accompanying pleasure, and not to fulfil the activity’s evolutionary function, as in using contraception to enjoy sex for recreation rather than for procreation. Similarly with art: whatever its original evolutionary significance, producing works of art and contemplating them are usually sources of considerable pleasure, cognitive rather than physiological, for those involved.

The birth of pictorial realism

What kind of meaning did the first permanent images communicate? The evolutionary perspective indicates that the earliest durable secondary visual representations of art should be closely linked to the lifestyle of the prehistoric hunters, who were interested primarily in chasing large game to obtain high-protein meat, in avoiding predators, and naturally in procreating to ensure inter-generational survival. The available archaeological evidence shows that the Upper Palaeolithic art was indeed part of the social exchange of information about objects and situations in the hunter-gatherers’ environment related to the above problems and challenges.

The best-known and most spectacular examples of early iconic culture are the Upper Palaeolithic cave paintings discovered in southern France and northern Spain, but there are grounds to suspect that the earliest permanent visual representations yet to come to light were not two-dimensional paintings or carvings, but three-dimensional sculpture. As we remember, the first human material artefacts, and for about two million years the only ones, were stone tools, and possibly wooden and bone implements which disintegrated over time. The immemorial practice of stone-knapping thus provided the necessary motor skills for carving, whereas painting on flat or curved surfaces probably began much later, following the indexical body decorations discussed in Chapter 4. It is possible therefore that with the appearance of fully human consciousness the need to create external iconic representations was first fulfilled by sculpture based on carving skills already well developed for hundreds of thousands of years, rather than by a newer and perceptually more abstract two-dimensional painting.

To date, the earliest three-dimensional imagery, from about 35,000–32,000 years ago, was found in Geissenklösterle and in Vogelherd in southern Germany. These are statuettes only about five cm long, nearly all of them carved from mammoth ivory, sometimes from mammoth bone. The small size of the pieces no doubt testifies to their portable nature, in keeping with the nomadic lifestyle of prehistoric hunter-gatherers. The statuettes are realistic representations of animals, including in the order of frequency felines, mammoths, anthropomorphic representations of animals, bison, bears and horses. The realism of representation suggests the instructive purpose – to help identify the species – while the choice of animals appears to reflect the main preoccupations of the Upper Palaeolithic hunters: avoidance of danger, hence the predominance of representations of large felines, human main animal foes, and hunting big game as the chief source of nutritious food, as represented by the other animal species. Other portable artefacts from the period, found in France, comprise similar small realistic sculptures, including a spear-thrower carved in the shape of a leaping horse (from Bruniquel, Tarn-et-Garonne), another spear-thrower carved in the form of an ibex looking over its shoulder (from Mas d’Azil, Ariège), and a mammoth ivory carving of a bison apparently licking its flank (from La Madeleine, Dordogne). All are small, decorated objects that the prehistoric hunter-gatherers would have carried around with them. Many of these pieces bear engraved or carved images of other animals, fish, birds, and sometimes what looks like half-human half-animal figures (Lewis-Williams 2004: 26, 197).

Iconic sculpture, precisely by virtue of its three-dimensional solidity, is more realistic and therefore more iconic than painting, whose flatness always involves some degree of non-iconic abstraction and conventionality. For stereoscopic vision natural perception is three-dimensional, which means that a realistic sculpture

is more iconic, more like the original in rendering both the outline, shape and solidity of the represented object. As the anthropologist Edward Hall also points out, sculpture is a tactile and kinaesthetic medium as well as a visual one, while painting is mostly visual, and tactile sensations involved in producing and handling sculpture are evolutionarily older and therefore more “natural” (Hall 1966: 77). Compared with realistic, solid, three-dimensional sculpture, the ability to paint two-dimensional figures that disregard the conformations of the surface they are painted on, and to recognize their correspondence with real figures (animals or humans) must have been a momentous development in prehistoric art, completed by the representation of the third dimension in the form of rudimentary perspective (e.g. an overlap of legs to indicate that one is behind the other). The anthropologist John Halverson likewise argues that the earliest works of art must have been three-dimensional sculptures; the next step would be high and low relief, engraving and incising; and finally, in the Upper Palaeolithic, two-dimensional painting, the medium that for technical reasons is less realistic and more abstract than sculpture (Halverson 1987: 66).

This would mean that the prehistoric cave paintings, such as those found in Chauvet and Lascaux, ancient as they are, probably do not represent the absolute beginnings of art. As Ernst H. Gombrich observes, the cave paintings are too controlled and too deliberate, and must have been preceded by thousands of years of image-making, mostly probably carved (Gombrich 2003: 91; Donald 1991: 278). The paintings also combine relief, and in many cases the natural unevenness of the rock surface may have suggested the outline of the animal superimposed upon it. Moreover, cave images were not only painted but also carved on the walls to create bas-reliefs. One of the most intriguing techniques was to use a natural rock fold, a crack or step to provide the outline of an animal’s body, while a few strokes of paint would then supply the missing parts (Lewis-Williams 2004: 28). Whenever possible therefore, the uneven rock surface would be availed of to create the effect of solidity and three-dimensionality, perceptually more “natural” than flat paintings.

The remarkable realism of cave art suggests its primarily communicative and instructive function – to encourage and facilitate the comparison between the images and their real-life equivalents: predators to be avoided and game animals to be pursued. It is possible therefore to view the prehistoric art primarily in the context of pictorial representations disseminating practical knowledge contributing both to survival and to the efficiency and success of hunting. Indeed, in harmony with the portable sculpture, the dominant theme in cave art, uniformly in Asia, Europe, and Australia, is the hunt, rendered with remarkable realism, focusing on the vital man-weapon-animal relationship. Given also the propensity of the human mind, all the more so in prehistory, to identify an iconic image with the object it represents, it can be surmised that the purpose of cave art was also utilitarian in

a magical sense – both to depict the hunt by instructing in its technique, and to exercise “control” over the depicted animals by a process of homeopathic magic (Morris 1962: 146).

As said earlier, the oldest caves painted with images of animals and anthropomorphic figures found in southwest Europe date to about 32,000 years ago, and one of the most spectacular is the cave in Chauvet in the Ardèche region of France, discovered in 1994. The cave contains over 300 paintings of animals: rhinoceroses, lions, reindeer, mammoths, horses, bison, bears, and an owl, many of them highly naturalistic, even depicted in action: one bison has seven or eight legs, as if to evoke movement, while other animals appear to be stalking or running. Some animals are rendered in perspective or shaded for relief, and many are executed with great detail, including eyes, ears, nostrils, and mouth. The overwhelming majority of the species represented are either hunted animals or dangerous animals, that is, all crucial to the survival of hunting-gathering groups (Chauvet and Deschamps 1996: 104–110, 114). Other Upper Palaeolithic caves with paintings, such as Altamira or Lascaux, reveal a similar preoccupation with hunting, often with scenes showing spears and arrows embedded in the bodies of the prey. Some drawings depict men dancing in animal disguises standing with heads bowed in front of animals. One suspects that the cave paintings had a similar psychological purpose to that identified in Chapter 5 for photography: to create a sense of control, reassuring if illusory, over the represented objects, here hunted or dangerous animals, both important to the existence of prehistoric hunter-gatherers. Both the act of painting and of contemplating the images would encourage, following the principle of homeopathic magic, an identification of the image with its real-life original, whereby what is done with the image would come to pass with the real thing (Wilson 1978: 172).

The other major theme of prehistoric art, of equal importance to the life of hunter-gatherers, is fertility, reflected in countless drawings and sculptures of the female figure, usually with great emphasis placed upon the breasts and reproductive organs (Donald 1991: 281). The archaeologist André Leroi-Gourhan surmises that not just individual images but entire cave settings represented spatially the theme of fertility as centred on male-female dichotomy. Leroi-Gourhan finds the human female represented metonymically by a vulva, the breasts, the belly, the pelvic region, or the thighs with a pubic triangle, often situated in the central area of the compositions, alone or accompanied by large herbivores, which Leroi-Gourhan interprets as “female” animals, including species such as the bison or the mammoth. On the other hand representations of the human male are more numerous and more varied in character, and include profile silhouettes, ithyphallic figures, isolated phalluses, or faces in frontal or profile view. Their topographical position is in nearly all cases at the back of the caves or on the periphery of a

central composition, that is, inversely to the location of the female figures. Leroi-Gourhan also observes that the male human figures occur in the vicinity of what he interprets as “male” animal species, such as horses, ibexes, and stags. Integral to the cave representations is also the metonymic iconicity of the phallus-like spear and the vulva-like wound: icons of sexual union and of death, of the cycle of life’s renewal, the actors of which would form two parallel and complementary series, including man/horse/spear, and woman/bison/wound (Leroi-Gourhan 1968: 113).

Incidentally, by focusing on the main distinguishing anatomic differences, the Palaeolithic metonymic icons for men and women, the phallus-like and vulva-like patterns respectively, seem more natural and universally recognizable than, say, today’s more conventionalized toilet door signs used in the West, in the form of a schematized icon of the whole human figure in two variants: one with forked, separate legs indicating trousers for men, and the other with a skirt, indicating women. Here the sexual differentiation is not based on natural anatomical features, but on cultural, conventional, and generalized gender differentiation that works even in societies where some men wear kilts and many women wear trousers. Despite this culturally biased generalization, iconic signs for men and women, like many other iconic signs used today, such as traffic signs, are more easily learned and more intelligible, if only because they ignore language barriers (Sassoon and Gaur 1997; King 2000: 20).

In Leroi-Gourhan’s model the entire cave can thus be seen as an iconic representation of the female body, the fact that would explain, he suggests, why the caves’ narrow passages, oval-shaped areas, clefts and smaller cavities are often marked in red, even sometimes painted entirely in red. These particular topographic features are also marked with signs from the male set, which thereby become complementary. In this way all of Upper Palaeolithic figurative art can be viewed as an early expression of iconic culture, one that combines the specifically human imitative capacity with the need to produce durable external vehicles of cultural knowledge, focused on themes most crucial to the life of early hunting-gathering societies, or indeed of any society: nourishment, survival and procreation. Although not all caves conform, or conform neatly, to Leroi-Gourhan’s systems of binary male/female oppositions, Lewis-Williams regards his hypothesis of the patterning of the caves’ iconography as correct in the main (Lewis-Williams 2004: 65). Whatever the specifics concerning the distribution and ordering of the “male” and “female” elements in the caves, the themes of fertility and survival that Leroi-Gourhan insists on in his structuralist model are also exactly what one would expect from an evolutionary point of view.

For Terrence Deacon in turn the Upper Palaeolithic cave paintings give us the first irrefutable and direct expression of a cognitive process that is capable of

conveying a rich cultural heritage of images and probably of verbal stories handed down from generation to generation. (Deacon refers to the Upper Palaeolithic culture as “symbolic,” although its imitative, figurative character, at least in visual arts, makes “iconic” a more appropriate description, “symbolic” being reserved for arbitrary, conventional signs, such as those used in syntactic language.) The cave paintings are also the first concrete evidence of the storage of culturally important iconic information outside the human brain. They mark a change in the structure of human cultures by providing evidence of the use of media that have persisted to the present (Deacon 1997: 374). Steven Mithen also emphasizes the fact that during the Upper Palaeolithic for the first time in human history material culture became a means by which the mind was extended beyond the biological limits imposed by the brain itself. Together with syntactic speech – which probably developed at the same time – the material artefacts extended the mind by allowing ideas to migrate between minds, hence enabling new ideas to be developed which could never have emerged from a single mind alone. An index of society that created it, material culture provides therefore a form of non-biological memory, by preserving ideas that could only have a transient existence in the mind. As Mithen puts it:

In little more than 50,000 years, by having “given up” their near-total reliance on the brain alone, humans have mentally evolved from having thoughts about no more than stone tools and acquiring food, to having thoughts about subjects no less than the origins of the Universe and the nature of the human mind itself (Mithen 2000: 217).

For Merlin Donald on the other hand the early iconic culture was simply a missing cognitive link between the apes and humans. Iconic (or mimetic in Donald’s terminology) culture predates in his view symbolic language, and can still be found in such cultural activities as trades and crafts, games, athletics, in many art forms, in the theatre, especially pantomime, and in most of social ritual. As a pre-linguistic ability iconic expression is primarily visual-motor; it is used in the acquisition and transmission of skills basic to child rearing, tool making, co-operative gathering and hunting, the sharing of food, constructing and sharing a shelter, expressing social hierarchies and so on (Donald 1991: 162, 167, 177). The pre-symbolic iconic representations of the Upper Palaeolithic art must have played a similar role in social education, especially of the young hunters, in which oral instruction into hunting techniques was aided by visual icons, not unlike in today’s classrooms with their overhead projectors and other audio-visual aids.

Fantastic representations

The predominantly realistic representations of cave art are complemented by a small number of fantastic images which, interestingly, relate not to animals but to humans, whose images are not only comparatively rare but are also consistently non-realistic, involving a visionary combination of anthropomorphic and zoomorphic features. The rarity of human iconic representations is surprising, given the working of the postulated innate social modules, including the face-recognition module, which ought to prioritize secondary representations of humans over animals. In Chauvet for instance there is not a single image of a complete human figure, although there is a number of “signatures” in the form of negative and positive hand prints – personal indexes most probably of people who produced the cave paintings. As noted earlier, in other caves there are numerous metonymic representations of male and female human figures, focused on the reproductive organs and implying the theme of fertility. As Leroi-Gourhan also points out, there is a limited number of schematic representations of complete male bodies, often in tragic situations. In Lascaux there is a painting of a man lying on the ground, with arms outstretched, in front of a wounded bison, while in the cave of Le Pêchelet there is a similar scene of a man lying on the ground, apparently struck by a bear’s paw (Leroi-Gourhan 1968: 131). Unlike in the images of animals, so naturalistic and detailed as to enable the viewer, then as today, to identify the species, the representations of the human figures are schematic and generic, focusing not so much on individual identity, still less on the personality of the figure, as on adaptively important types of situations involving fertility, danger, and survival.

The oldest anthropomorphic art work on archaeological record is the ivory statuette from Hohlenstein-Stadel in southern Germany, dated to about 33,000–30,000 years ago, showing a man with a lion’s head, carved from the tusk of a mammoth (Mithen 1999b: 155; Lewis-Williams 2004: 202). Among the most debated Upper Palaeolithic cave paintings is also the outline figure of an ithyphallic man from Lascaux (the only anthropomorphic figure in this cave), who appears to be falling backwards, his arms spread out. The most remarkable thing about this man is that he has a bird’s head and four-fingered bird-like hands, which would suggest that the figure is bird from the waist up and human from the waist down. Lewis-Williams interprets this image as representing a shaman transformed into his bird-like spirit helper at the moment of death, his erect phallus suggesting the role that shamans play in the fertility of their communities (Lewis-Williams 2004: 264). In the cave of Trois-Frères in France there is also a painted anthropomorphic figure of a “sorcerer,” with an upright posture, with human legs and hands, with the back and ears of a herbivore, the antlers of a reindeer, the tail of a horse, and a phallus positioned like that of a feline. The composite nature of this anthropomorphic

figure seems to result from what Steven Mithen describes as the cognitive fluidity of early humans, who were able to make mental connections across different experiential domains and associated types of intelligences, here related to social life and natural history (Mithen 1999a: 164). Cognitive fluidity thus understood also illustrates another step in iconic thinking that goes beyond realistic, faithful representation of what is actually there in the natural world. The Palaeolithic artists who painted the “sorcerer” and other composite figures brought together a number of realistic elements observed in humans and several animals, and created a fantastic, combined image of a creature that has no original outside the artist’s mind.

Such meta-icons, consisting of isolated realistic (that is, referential) elements found in different objects, and combined into non-realistic representations will become common in the art of the Neolithic, Bronze and Iron Age civilizations, to continue until modern times in folklore and fantasy genres, giving rise to dragons, satyrs, sphinxes, griffins, the Pegasus, centaurs, mermaids, unicorns, werewolves and other monsters. The particular meanings of such fantastic creatures can be described in terms of metainformation arrived at by combining the primary meanings, or parainformation, normally attached to the real objects in their original contexts, and creating a new, more conceptual and abstract meta-meaning. For example, the Greek Pegasus, or the winged horse, combines the anatomical features of a domesticated mammal used for draught work and riding with the wings of a bird, to create a fantastic meta-animal that can carry its rider as fast as the flight of a bird over land and in the air – an ancient version of James Bond’s super-car doubling as a private aeroplane.

The relative scarcity of human figures in cave art is also surprising given the anthropomorphic way of thinking of early humans, which would suggest not only a strong interest in the human figure, but also a tendency to endow non-human elements of the environment, both animate and inanimate, with human-like qualities. As I mentioned earlier, anthropomorphization of the natural and cosmic environments is in itself a spectacular example of iconic thinking, and appears to be universal among humans, including the prehistoric hunters. Steven Mithen suggests that projecting human qualities onto the natural environment was a useful adaptive illusion, in that it could substantially improve the hunters’ prediction of animal behaviour (Mithen 1999a: 166). Anthropomorphic thinking still pervades our everyday lives, as evidenced for example by a habit of attributing human feelings, purposes, and intentions to pet animals. Ancient fables, that is, stories in which animals think and act like humans, as well as modern animated cartoons full of speaking animals also exploit our compulsive anthropomorphization of animals, first attested in prehistoric art.

Iconic roots of metaphors

The ability to make associations across different mental and experiential domains (psychological, social, biological, physical) facilitated by human cognitive fluidity, combined with iconic, or imitative thinking, is what enables us to draw analogies and create metaphors, visual or verbal. For example, to call a boxer “the raging bull,” as in Martin Scorsese’s film from 1980, does not imply of course that the boxer is literally a bull, despite the affirmative mode of the expression, which seems to establish an illusory identity between the two: what the title of the film is really implying is that the boxer is *like* a raging bull. The metaphor here is an instance of iconic thinking: it draws on an analogy, or comparison, between two otherwise different objects, the representatives of humanity and of the animal kingdom respectively, which are brought together because of certain perceived common traits, such as physical strength, ferocity, determination and so on.

For Pascal Boyer metaphor is similarly motivated by the actual dissimilarity and perceived tension between the subjectively associated terms, as when calling a devious person (a human being) a “snake” (an animal). Listeners or readers of the Bible, or viewers of a painted Biblical serpent designed to represent “evil” obviously do not literally identify a human (or a human-like figure such as Satan) with a reptile species, but the imagined analogy between generically different objects in a metaphor is what sustains our attention and stimulates our imagination. The inherent incompatibility (due to lack of identity) between compared objects is also what, according to Boyer, accounts for the vagueness and elusiveness of metaphors, especially of so-called religious symbols, with their “superficial brilliance and hidden vagueness,” which is “both persuasive and question-begging,” by “suggesting a lot but demonstrating very little” (Boyer 1994: 53). The meaning of iconic visual signs is more quickly and more easily if intuitively identified than the meaning of arbitrary symbols of language, but iconic signs also tend to be more ambiguous than verbal language, which may explain the preference for iconic images in magic and divination, where they are designed to create deliberately vague and oracular meanings (King 2000: 21).

Incidentally, what we call religious symbols are not really “symbols” in the semiotic sense of entirely conventional, arbitrary signs; “religious icons” would be a more appropriate term, but again not in the historic sense of images of saints and other holy personages worshiped in the Eastern Orthodox Church. Religious signs such as the cross or the lotus, the signs of good luck such as the horseshoe, the sign of danger such as the skull with crossbones, the national flags and heraldic devices such as the stars and stripes or the eagle and so on, are all conventionalized but still largely iconic, that is, figurative in their schematized resemblance to the represented object. The iconic quality of religious, national, or otherwise socially

significant visual signs makes it easier to identify their meaning than would be the case with purely arbitrary symbols, even if that meaning remains ambiguous, elusive, and “mysterious.”

The visual or verbal metaphor as a universal expression of iconic thinking is also one of the two most important ways (in addition to metonymy) of organizing linguistic discourse, according to Roman Jakobson’s celebrated formulation. For Jakobson speech implies a selection of certain linguistic entities and their combination into linguistic units of a higher degree of complexity. At the lexical level, for instance, the speaker selects words and combines them into sentences according to the syntactic rules of a particular language. Thus any linguistic sign (word) involves two modes of arrangement: *combination*, which means that any sign always occurs in combination with other signs (words) in a sentence; and *selection*, which implies the possibility of substituting one sign for another. The addressee thus perceives an utterance as a combination of constituent parts (sentences, words, phonemes) selected from the repository of all possible constituent parts. The constituent parts in turn are in a state of what Jakobson refers to as *contiguity*, which implies the same semantic context. On the other hand in a substitution set signs are linked by various degrees of *similarity*, which fluctuate between the equivalence of synonyms (semantic identity) and antonyms (semantic opposition). Developing the discourse along the lines of substitution or similarity is what Jakobson calls the *metaphoric pole* of language, as when one word, phrase, sentence, or the whole topic leads to a semantically different but similar one. In practice, making comparisons based on similarity between semantically different and functionally incompatible domains means engaging in metaphoric discourse, as exemplified by poetic language, Surrealist painting, or the Montage school in Soviet cinema (Jakobson and Halle 1971: 72–75, 90–92). As a structural linguist Jakobson was concerned primarily with the synchronic, present-day view of language, but it is illuminating to realize that from a diachronic, or even broader evolutionary perspective, the metonymic and the metaphoric poles of language are ultimately rooted in the practice of using language to communicate both the immediate, contiguous experience and displaced, iconic associations, respectively, as evidenced for the first time by the visual culture of the Upper Palaeolithic.

Verbal metaphors pervade human language, not just in poetry but frequently in everyday speech, as probably the most obvious expressions of the human capacity to engage in metainformational communication. In Steven Pinker’s example, when we use language we “gather our ideas to put them into words, and if our verbiage is not empty or hollow, we might convey or get these ideas across to a listener, who can unpack our words to extract their content” (Pinker 1995: 246). In this sentence the invisible mental process of coding meaning into words, saying those words to the listener who then invisibly decodes them in his mind, is related

by way of analogy to the visible physical action of gathering objects, putting them into containers, and passing the full containers to someone else to open and retrieve the objects. For all we know, non-human animals are incapable of creating, still less expressing metaphoric meanings, even if the impulses in their brains accidentally “jump” between different experiential domains. Except in tales of fantasy animals also lack consciousness, extended working memory, verbal language, and other meta-cognitive phenomena such as humour, sarcasm, or irony. As one human character says about an unusually smart mouse in the film *Mouse Hunt* (1997): “Mice don’t mock, they don’t have a sense of humour or irony. He’s not sitting in his hole in a smoking jacket, sipping cognac and giggling to himself.”

While meta-thinking remains a defining characteristic of human cognition, one must not overstate the case by constantly and obsessively looking for “hidden meanings,” “esoteric symbolism,” and “secret codes” in all human artefacts, especially in those produced by societies dominated by magical and religious thinking. Visual metaphors such as those found in fantastic, composite images remain a vivid testimony of human cognitive fluidity, or what we usually call imaginativeness and inventiveness, but equally thrilling to produce and to contemplate are realistic representations of familiar objects, especially of humans and animals, in recognizable settings. As the most spectacular periods in the history of art demonstrate, from the Upper Palaeolithic cave paintings, through Greko-Roman antiquity to the Italian Renaissance, most attractive to contemplate are the realistic, life-imitating representations of familiar and existentially important elements of human environment, rather than the fantastic or the strange. For the greatest artists the world as they saw it was fascinating and wondrous enough, for as Oscar Wilde once said: “it is only the unimaginative who ever invent anything” (Wilde 1994: 495).

CHAPTER 8

The thrills of visual realism

The style of visual representation in art that emerged in the first urbanized centres of the civilizations of Mesopotamia and Egypt was quite different from the naturalism of the Upper Palaeolithic art: still iconic, that is, representational, but much more schematic, stereotyped and rigid. Indeed, nothing to equal the naturalism of cave art was to appear again in Europe until Greeco-Roman antiquity, and later during the Italian Renaissance when realistic sculpture and life-like perspective drawing and painting were reinvented following the classical model. The departure of pictorial representation from naturalism and towards schematic and geometric simplification began in the Neolithic period, probably due to the introduction of agriculture and its technology, and in particular due to the engineering skills developed by the builders of the early settled communities (Gombrich 2003: 93). The psychologist Desmond Morris also associates the rigid style of the Neolithic art with early urbanization and the invention of writing. As hunting gave way to farming, storing of goods and trading, the need to keep records and to draw up inventories arose, eventually giving rise to writing – a more conventional and less pictorial system of coding information, more efficient in communicating precise quantitative data involved in commerce (Morris 1962: 149; Humphrey 2002: 150). For example, a single symbolic sign for twenty cows could be used instead of an iconic picture of twenty cows, or of more conventionalized notches or other marks representing cows. Realistic pictures were thus gradually losing their informative and instructive value, although one suspects that their magical significance remained, especially in the context of religious art. As the arbitrary signs used in writing and numerical notation became more common, iconic representations dwindled in importance in practical life, remaining confined either to the purely artistic, decorative sphere, as in ancient Greece and Rome, or to the magico-religious, ideological domain, as evidenced by Egyptian and later Christian art.

The importance of pictures in social communication outside art and religious life was further diminished in early modern times following a major boost to the culture of the written word caused by the advent of printing. In the nineteenth and twentieth centuries in turn the invention of photography and film revived the iconic, mimetic culture on an unprecedented scale, due to the unique combination of iconicity and indexicality that gave the photographic media a degree of accuracy and naturalism of representation hitherto unattained in the history of visual

culture. At the same time the increased realism of the photographic media, including the life-simulating movement and ambient sound of film and television, effectively sent traditional painting on a path away from realistic representation towards abstraction and non-iconic visual experimentation, especially in the realm of colour, as evidenced by European painting from Impressionism onwards. Unable to compete for accuracy and realism with the photographic media, twentieth-century visual arts steered towards non-iconic imagery, abstraction, conceptualism, or metaphoric surrealism. However, despite the radical departure of modern painting and sculpture towards non-realism, taken as a whole contemporary visual culture remains overwhelmingly naturalistic, mainly due to the ubiquity of iconic-indexical representations of reality as communicated through still photography, cinema, and television.

Art and ideology

Historical oscillations between realistic and non-realistic conventions in art appear to reflect shifts in ideological systems that define the prevailing values, and consequently the social role of art. Thus realistic representations dominate whenever the main purpose of visual culture is to reflect the empirical, physically experienced world, rather than to express the invisible, supernatural reality as postulated by religious beliefs. The life-like naturalism of animal imagery in the Upper Palaeolithic art would therefore be due to the largely practical, instructive and non-religious character of these highly iconic representations, designed primarily as an aid to recognition and possibly magical control of both game and predatory animals encountered in the real world. With the advent of agriculture in the Neolithic period hunting declined in importance, both as the main source of food and as the reason for nomadic lifestyle, being gradually replaced by permanent farming that eventually produced the first urbanized centres of ancient civilizations. With the increasing size and structural complexity of agricultural societies and the ancient states, the role of organized religion, with complex cosmologies, pantheons, systems of dogma and elaborate rituals increased accordingly, providing ideological justification for social hierarchies and political control of larger and more stratified societies. The supernatural world with its hierarchical pantheons described in religious myths of ancient Mesopotamia and Egypt for example, became more and more removed from the empirical reality as people knew it from their daily lives, just as art – now almost exclusively religious in character – was losing its iconic, mimetic quality in relation to the physical world in favour of abstraction and schema that reflected the non-empirical, metaphysical reality.

This is why ancient Egyptian painting and relief avoided the naturalistic rendering of the third dimension: as argued by Ernst H. Gombrich recession and foreshortening would have introduced a subjective, human, life-like element, which it was not the purpose of religious art to do (Gombrich 2003: 15). Indeed, for several thousand years Egyptian representational art never made use of linear perspective that injected such realism into Greek art beginning with the middle of the sixth century BCE. Like the Cubist painters of the early twentieth century, the Egyptian artists drew what they conceptualized or imagined rather than what they saw. Their technique of representation was to draw separately the main features of the objects, animals, humans, or anthropomorphic deities. These features, each of which roughly regarded as flat, were drawn one by one in the plane of the picture, independently of their relative orientation in space – hence the well-known fact, for instance, that the Egyptian picture of a human head combines the profile of the head with a frontal view of the eye (Pirenne 1970: 175). In 1867 the art historian Ernst Mach observed that the principle employed by the Egyptians might best be described by saying that their figures are pressed in the plane of the drawing like plants in a herbarium. The Egyptians, as well as the Babylonians, early Greeks, and Etruscans avoided realistic foreshortening and perspective, but not because they found them too difficult, or were unaware of them (Arnheim 1974: 112). The Egyptian style of representation can in fact be described as more objective than the perspectival, that is, more subjective style of visual representation developed by the Greeks, and later perfected by Renaissance artists. The Egyptian model insisted on highlighting what was considered the most important features of an object (the silhouette of the body, the profile of the head) in a timeless, unchanging aspect, which produced the effect of lifeless rigidity, apparently more suitable for the anthropomorphic figures of the deities inhabiting the eternal, divine world.

By contrast, the classical (Greek and Renaissance) pictorial convention, which has shaped modern European visual culture, is based on the concept of the three-dimensional object perceived subjectively from one fixed point of observation – roughly the procedure of the photographic camera. Interestingly, however, this realistic convention is not “truer” to the object than the method employed in Egyptian religious art; it is simply more subjective and more individualistic – in other words more humanistic. When the figures in Egyptian art look “unnatural” to a modern observer, it is not because the Egyptians failed to present the human body the way it “really is,” but because today’s observer judges their work by the standards of a different procedure: a subjective one that presents the figure from a fixed point of view of a single observer, not objectively in one unchanging, universal aspect (Arnheim 1974: 113). The Egyptian and the classical Greek methods thus represented different solutions to the problem of rendering three-dimensional objects in a two-dimensional plane, what Gombrich refers to as “pictographic”

(flat, schematic), and “photographic” (three-dimensional, realistic) styles, respectively (Gombrich 1999: 49).

An advance towards the third dimension, which grants the eye its share in the perception of modelling, was indeed made for the first time by the ancient Greeks, whose concept of art as a mirror up to nature and as a purely visual mode of rendering objects, especially of the human body, remains to this day the chief artistic expression of classical humanism, with its insistence on strictly human faculties of mind, body and the living space, as opposed to the supernatural beings and the divine world. The growing tendency towards naturalistic representation was encouraged by a steady decline in religious outlook which culminated in Greek humanism, rational philosophy, and early science. Gombrich also links the rise of realistic art with the birth of the critical attitude in Greek culture, and with science as its practical consequence, especially the sciences of anatomy and of projective geometry and optics, which were called in to hasten the experimentation towards recognizable images. In modern times science overtook art in this respect through the invention of photography and especially of film, with its realistic movement, colour, sound, and the wide screen to match human wide horizontal vision (Gombrich 1982: 11, 27).

There are few more exciting spectacles in the whole history of art than the awakening of realism in Greek sculpture and painting between the sixth and fourth centuries BCE. Not just in static arts: the same scientific and humanistic impulse that encouraged the evolution of mimesis in sculpture and painting, with their increasing approximation of visual representations to natural appearances, also resulted in the development of drama: the demand to see the events narrated by the poets and historians re-enacted as if they were happening in front of the audience, what Gombrich calls the “eye-witness principle” as a manifestation of mimetic and humanistic culture. In painting this insistence on authenticity and verisimilitude must ultimately have led to the mastery of foreshortening, the rendering of a unified space, of light and shade, as seen on Greek painted pottery among other things (Gombrich 1982: 252; 2003: 99–101).

The tendency, truly unique in the ancient world, towards increasing “photographic” naturalism characterized Greek sculpture and painting from the archaic to the Hellenistic periods (seventh to first century BCE). After the middle of the seventh century the Greeks began to carve large figures of men out of marble, modelled initially on statues made in other hard stones in Egypt. Unlike the Egyptian models, however, the Greek statues were less religious in character – the most popular type was a nude male figure standing facing front, so-called *kouros*, “young man,” which would be either a representation of a god, or a memorial of a man, sometimes placed upon his tomb. The development of the *kouros* from the seventh to fifth century shows increasing naturalism of bodily anatomy and posture: the

early rigid and schematic figures become more relaxed and life-like, with their heads turned slightly and the body in *contrapposto*, with the weight shifted onto one leg, the other relaxed and placed forward (Woodford 1982: 7–12). The adoption of bronze casting in the early fifth century BCE allowed for even more naturalistic sculpture, because the new technique was more flexible, offering a possibility to render the human body in a wider, more realistic range of poses and attitudes (precisely the reason why the bronze-casting technique was invented). Sculpted figures could now hold their arms outstretched, a posture impossible to achieve in heavy marble, which cannot support its own weight. For instance the bronze statue of Zeus of Artemisium from the fifth century shows the god with his left arm extended forward, his right arm reaching behind to throw a thunderbolt – a dynamic, life-like pose impossible to achieve in marble, as the outstretched arms would simply break off under their own weight. As the art historian Susan Woodford demonstrates, the tendency in Greek sculpture of the classical period was decisively towards imitation of natural appearance, that is, towards increased iconicity, with sculptors trying to capture in stone or bronze the subtle qualities that distinguish people of different ages and temperaments. The sensitivity of these characteristics had given a breadth of humanity to Greek art, whose naturalism far outdistanced anything that had been seen before in the ancient world (Woodford 1982: 56).

In the Hellenistic period the humanism and naturalism that define ancient Greek art deepened even more. In sculpture human beings were characterized not only in terms of sex, age and personality, as they had been during the classical period (fifth century BCE), but now also in terms of emotion and mood. Sculptors began to specialize: some became adept in the rendering of passion, and others in portraying more lyrical moods and gentler emotions. Hellenistic painters also developed greater interest not just in mythological figures or historical personages but in ordinary people and their everyday life. A certain Peiraikos earned artistic distinction by painting barbers' shops, cobblers' stalls, asses, eatables and similar mundane and ordinary objects. A Roman mosaic, a copy of a Greek painting from the third century BCE, shows a commonplace scene: a group of street musicians wearing masks, and a poor boy who either accompanies them or is just an on-looker. The modelling of the figures is very realistic, and the play of light is handled with consummate skill. There is also an accurate rendering of the shadows cast by the players on the pavement and on the wall, as well as the bright highlights and deep shadows in the shiny clothes of the musicians (Woodford 1982: 70–74). Hellenistic painters also broadened their subject matter to include flora, fauna, and landscape – the secular genres subsequently reinvented in post-Renaissance Europe nearly two thousand years later.

In painting the Greeks were also the first to introduce perspective as a way of mimicking a “photographic” perception of space. From the end of the sixth century

the Greek vases depict the human body in foreshortening, with shading to give the appearance of mass, and with perspective effects of a kind quite unknown in earlier times. Before the Greeks no culture (the Upper Palaeolithic cave art being unknown at the time) produced illusionistic pictures showing three-dimensional objects in space on a flat surface. For example, the paintings by Polygnotos (mid fifth century BCE) show some figures higher than others as an indication of distance from the observer. In the late fifth century the painter Agatharchos experimented with vanishing points (receding lines in architectural drawings that converge at a point), which apparently stimulated contemporary philosophers Democritus and Anaxagoras to make a theoretical study of perspective (Woodford 1982: 49). During the Hellenistic period, around the middle of the second century BCE, artists became interested in the representation of space in its own right, not just as the ambience in which people and things exist. This encouraged a vogue for painting architectural vistas in Roman houses beginning with the first century CE, which showed cities, palaces, and sanctuaries, but without human figures. In these painted vistas, skilfully applied shadows within the wide tonal range of reds, yellows, whites and blues helped to convey a sense of depth and distance. The receding lines of buildings also strongly suggested space although, as Susan Woodford observes, the perspective was neither unified nor consistent. Each architectural element would be foreshortened more or less independently, without any regard to the whole (Woodford 1982: 71–74). Such a piecemeal perspective schema suggests that however evocative the Greeks made their architectural vistas, they never fully developed a single-point perspective system such as was later formulated in the Renaissance. Once this quasi-photographic rendition of space had been widely used and accepted in Greeco-Roman art, there was no return to the purely pictographic mode of representation, even after the suppression of classical humanism during the Christian Middle Ages. Elements of foreshortening remain present in Byzantine and in Western medieval art, even though the paintings with their sacred content are no longer constructed on the basis of a central projection from a single point, in imitation of the point of view of a human observer (Pirenne 1970: 182).

Religion and realism in art

The dominance of either the pictographic or the photographic style in artistic representation depends therefore on the prevailing ideology: the less religious and dogmatic it is, the more iconic, that is, more realistic and photographic the visual arts become. And conversely, the greater the influence of religious dogma on social life the more rigid, schematic, and pictographic, that is, less iconic art becomes, to the extent that in cultures dominated by religious fundamentalism, as in

Judaism, Islam, or early Puritanism, representational art can disappear altogether. On the other hand, as evidenced by the art of classical Greece and post-Renaissance Europe, the more humanistic, philosophic, and scientific the dominant outlook, the more realistic artistic representations become, as the secular ideology encourages the artists' interest in the life in this world, in a defined socio-historical context, in all manifestations of human experience. As Nietzsche put it: "Art raises its head where creeds relax." By contrast, in religion-dominated epochs or cultures whatever art is permitted is focused on the transcendental and the supernatural, while iconic representations are either reduced to non-realistic schemas and abstractions, or are eliminated altogether.

The unique appearance of mimetic arts in classical Greece has always puzzled historians, Ernst H. Gombrich among others: "If only the tricks of naturalistic painting result in convincing images that make for effortless recognition, how can we explain the fact that most cultures are quite happy with schematic representations?" His answer is that "the purpose of [Greek and Renaissance] art that led to the discovery of illusionistic devices was not so much a general desire to imitate nature as a specific demand for the plausible narration of sacred events," now presented "on an imaginary stage as they might have looked to an eye-witness" (Gombrich 1982: 20). It is true that the subject matter of much of Greek and most of Renaissance art is still religious, despite the naturalism and humanism of the manner in which the sacred scenes are depicted. But Gombrich's explanation of the origin of mimetic art in terms of "a specific demand for the plausible narration of sacred events" only begs another question concerning the origin of that demand, and why it had to arise in Greece and not, for example, in Egypt or elsewhere in the ancient world. And why should the demand for naturalistic representation of religious scenes reappear in fifteenth-century Italy, after almost a thousand years of pictographic schemas of medieval art?

The demand in question must have been the result of ideological shifts from religion-dominated to philosophy-dominated societies, whatever the broader historical reasons for these shifts and for the relative rarity of their occurrence. We admire the ancient Greek and early modern Italian artists for their skills in rendering the human body and the physical space with life-like accuracy, but those skills could only flourish in ideologically relaxed regimes, under the influence of humanistic philosophies which not only permitted but actually encouraged and expected naturalism in art. By the same token, the fact that we are lacking Leonardo, Botticelli, and Michelangelo in the Middle Ages has less to do with the dearth of potential artistic geniuses prior to the Renaissance, than with the fact that talented individuals happened to live in the times when religious dogmatism, with its glorification of divinity on the one hand, and with its ideals of asceticism,

humility and self-effacement on the other hand, positively discouraged individual expression and humanistic attitude in art.

For almost a thousand years following the fall of the Roman Empire in the fifth century CE, the contact of art with the visible, empirical world was indeed extremely tenuous. As a result of the insistence of the Christian religion on the invisible, supernatural reality, naturalism in artistic representation was effectively rendered irrelevant for a millennium. The art historian Erwin Panofsky documents the gradual disintegration at the close of antiquity of the freely extended, naturalistic landscape and the geometric interior space found in Roman painting. Representation of depth gives way to superposition and juxtaposition, while the individual pictorial elements, whether figures, buildings or landscape motifs, are transmuted into forms oriented towards schematic plane rather than three-dimensional space. These forms now stand in relief against a gold or neutral ground, and are arrayed without respect to realistic compositional logic. The principle of space begins to give way to the principle of the surface bounded by the picture's edge, a surface not to be "seen through," as in perspectival paintings, but rather to be filled. Space is robbed of its solidity, becomes homogenous, immeasurable, and dimensionless: the "reduction of space to surface" evidenced in particular in Romanesque painting (Panofsky 1991: 49–51). The departure from representation that would create a verisimilitude to empirical, sensory perception of space and objects in it thus coincided with the growth of ideological control of the Christian Church, with its vision of the transcendental, divine world that was by definition qualitatively different from the human and natural worlds. In the cultural climate dominated by strict religious dogma, whatever artistic representation of the supernatural reality was permitted did not include any recognizable resemblance of that reality to the world that people knew from their everyday experience, which effectively ruled out naturalism from art. Judaism and Islam, as we know, went even further by actually banning not just religious art but all image-making as blasphemous (Mann 2000: 21, 24, 30). The fact that medieval Christian art still presents the divine and holy figures in anthropomorphic, if schematized and rigid form, is probably to be seen as a compromise between the demands of the religious doctrine which expressly prohibits the making of images, and the didactic requirement to bring the Christian message across to the illiterate masses by means of more easily absorbable iconic instruction.

Indeed, the "magical" power of the visual image posed a dilemma for the Church, which feared idolatry but hesitated to renounce the image as an effective means of communication. Neither the Church nor the artists of the Middle Ages could ignore the second commandment, which enjoined them not to make "any graven image, or any likeness of any thing that is in heaven above, or that is in the earth beneath, or that is in the water under the earth" (*Exodus* 20:4). In the light of

this doctrine it is indeed a miracle that, unlike Judaism and Islam, Western Christianity continued to tolerate the making of images in religious contexts. Erwin Panofsky suggests the influence of Byzantine art and Eastern Christianity, which managed to preserve the individual components of antique perspectival space, and so to hold them in readiness for the Renaissance (Panofsky 1991: 50). The Church's concession to continue making images is found early in the pronouncement of Pope Gregory the Great (?540–604), which acknowledges the didactic purpose of images: "Painting is to those who cannot read what letters are to those who can" (Freedberg 1989: 164; Gombrich 1999: 24). Pictorial religious instruction was precisely the task assigned to the visual arts by the Church to avoid the charge of idolatry, and it thus enabled Christian art to survive at all. Writing in 1435, when art was taking a more naturalistic, that is, a more "idolatrous" turn, the architect Leon Battista Alberti could still feel the need to justify image-making on religious grounds, by considering it "a very great gift to men that painting has represented the gods they worship, for painting has contributed considerably to the piety which binds us to the gods, and to filling out minds with sound religious beliefs" (Alberti 1972: 61).

Didactic reasons aside, even in its doctrine Christianity appears to be more anthropomorphic, or humanistic, than Judaism or Islam, for apart from monotheism which Christianity shares with the other two universalistic religions, it also talks about the incarnation of god's son in an earthly woman. Likewise its mythology, as exemplified by the story of Christ, is set in the context of the all-too-human experience of joy, love, suffering, betrayal, grief, mercy, forgiveness and so on. The doctrine of the incarnation, whereby the indescribable divine element became circumscribed by empirical, historical human form can thus be partly at least responsible for the relaxed attitude of the Church towards the scriptural prohibition on all visual representation. By contrast, Judaism does not believe in god's incarnation, and consequently in the visual limitation of the deity. In 1422 a Spanish Jew, Rabbi Moses of Arragel, the translator into Spanish of the Hebrew Bible, wrote that "the Jews... do not think or believe that God took on a human form. Everyone, scholar and peasant, women and children, must know that God has no human face or image, and that there is nothing that resembles him" (Mann 2000: 28). In view of the comparatively more humanistic character of Christianity, it seemed more natural to support doctrinal teaching with anthropomorphic, iconic representations, thus conveying the religious message in cognitive categories that most people could relate to and understand, as in presenting the divine but also very human figures in situations of joy (the nativity) or sorrow (the crucifixion). The reduced, schematic iconicity of Christian art in the Middle Ages was thus a compromise between the Old Testament blanket ban on any pictorial representation of

the deity, and the need to educate the masses in the Christian doctrine by appealing to their humanity.

The rediscovery of the body

Once the dogmatic constraints were relaxed during the Renaissance following the revival of ancient humanism, and artists were again permitted to render the world as it presented itself to their senses, realism and imitation of nature were relatively quickly “reinvented,” allowing the artists to sculpt and paint the bodies, including the sacred figures, with anatomical accuracy and natural beauty as observed in life. This humanizing tendency can already be seen in the art of the high Gothic, especially in sculpture, which is beginning to re-emerge out of the wall as an independently developed structure of considerable realism. Panofsky interprets the Gothic “renaissance of a feeling for the body... as a kind of rapprochement with antiquity” (Panofsky 1991: 53). It is also an interesting fact that the three discoveries of realism in art on historical record: in the Upper Palaeolithic, in ancient Greece, and in fifteenth-century Italy, should start with the three-dimensional medium of sculpture, before artists developed the convention of rendering space in the two-dimensional medium of painting. As we saw earlier, the Upper Palaeolithic portable sculptures most probably predated cave paintings, just as the ancient Greek practice of carving human figures in marble or casting them in bronze developed before painted pottery and murals. Similarly in the Italian Renaissance: the emerging realistic style first manifested itself in sculpture and in architecture, and only later in painting. For instance, the three most prestigious artistic personalities in early fifteenth-century Florence, the capital of Renaissance culture, were not painters; all were trained as goldsmiths and to varying degrees worked as sculptors. The oldest, Filippo Brunelleschi (1377–1446) became the most original architect and engineer of his generation, and was besides the inventor of linear perspective, the *sine qua non* for Renaissance narrative painting. His system was utilized in painting by Masaccio (1401–28), perhaps under the direct guidance of Brunelleschi, as exemplified famously by a fresco of *The Trinity* in the church of Santa Maria Novella, and by a fresco cycle on the life of Saint Peter in the Brancacci Chapel, both in Florence. Brunelleschi’s contemporary Lorenzo Ghiberti (1378–1455) also remained devoted exclusively to sculpture throughout his lifetime, as was Ghiberti’s slightly younger contemporary Donatello (1386?–1466), who turned to monumental sculpture in marble and bronze, producing among other things the famous bronze *David* (1430), the first male Renaissance nude. According to the art historian James H. Beck, both Donatello and Ghiberti exerted a powerful effect on the painters who came after them. Masaccio probably could not have developed his

perspectival painting without the example, instruction, and possibly collaboration of Donatello and Brunelleschi. As Beck observes, at the beginning of the fifteenth century the sculptors were about half a generation in advance of the painters, working in an idiom whose spatial and figurative qualities are inseparably tied to our notion of Renaissance art (Beck 1999: 37, 41; Holmes 1996). For technical reasons also it was easier to develop linear perspective within the three-dimensional media of sculpture and architecture first, and then apply it to a more conventional and less iconic medium of painting, the more convincingly to create the illusion of space on a two-dimensional surface.

Realistic rendition of space went hand in hand with interest in the anatomy and realistic appearance of human body and face, which now appears to take precedence before any doctrinal, ideological considerations. For instance, neither Donatello's nor Michelangelo's statue of David strikes one as particularly religious, despite the obviousness of the Biblical theme; what seems to have been unembarrassingly more important to the sculptors was the beauty and natural attitude of a young, well-built, male nude body, with the religious reference thrown in almost by accident as it were. In his treatise *De Pictura* (1435) Alberti stresses repeatedly that the "noble and beautiful art [of painting and sculpture] arises from roots within Nature herself." Expressing the view already prevalent in the early Renaissance Alberti states that "painting aims to represent things seen" (*pictura studeat res visas repraesentare*), and also that "the painter is not concerned with things that are not visible" (Alberti 1972: 33, 67, 75). The imitation of nature, that is, reproducing what the artist sees in front of him rather than what he imagines or conceptualizes, was a revolutionary discovery, or rather rediscovery, of the fifteenth century. When Giorgio Vasari (1511–1574) praised the early Renaissance painters in his *Lives*, it was in proportion to the life-like naturalism achieved by them. For example, artists were commended for painting a human figure so that it seemed to breathe, or appears not painted but three-dimensional – as if in relief. Every time Vasari talks about excellence, perfection or grace in art, he means the convincing verisimilitude of visual representation of human figures, its closeness to the "photographic" ideal. His view of art is therefore entirely humanistic and aesthetic, not doctrinal; for him art must imitate nature and give pleasure: "the origin of the arts... was nature itself, and the first image or model was the beautiful fabric of the world" (Vasari 1987: 30).

Vasari traces the historic beginnings of the new mimetic style in art to Giovanni Cimabue (c. 1240–1302?), who was the first to break decisively with the pictographic tradition of Byzantine art, whose style Vasari describes as "crude, stiff, and mediocre," with its "unbroken outline, as well as staring eyes, feet on tiptoe, sharp hands, absence of shadow, and other Byzantine absurdities" (Vasari 1987: 50, 88). In the place of rigid and schematic Byzantine figures Cimabue used fresh colours

to render flesh, and he painted *scenes* from the life of Christ rather than isolated figures against a plain background, thus achieving dramatic, vivid, and emotionally charged effect. When the Florentines flocked to see Cimabue's paintings they were thrilled and awed by their life-likeness, probably not unlike people centuries later when they first saw a photograph, a moving picture, or the first television programme.

After Cimabue his pupil Giotto (1266–1337) further developed the mimetic convention by introducing the technique of drawing accurately from life and infusing his religious figures with human emotions. In Vasari's account Giotto depicted the Virgin Mary as "fearful and trembling" before Archangel Gabriel, and in his painting of the presentation of the Christ-child to Simeon in the Temple from the church of Santa Croce in Florence Giotto depicted "the *emotions* of the child Himself, who is *frightened* of Simeon and all *timidly* stretches out his arms and turns towards his mother" (emphasis added). On a fresco in the church of San Francesco at Assisi Giotto "painted the various costumes worn at that time and his observation and imitation of nature are marvellous to see. One of the most beautiful scenes is of a man showing signs of great thirst kneeling down to drink eagerly at a fountain; the incident is conveyed so exactly and movingly that one might be looking at a real person" (Vasari 1987: 59, 61). Vasari conveys the persuasiveness of Giotto's realistic style in an anecdote in which the painter, still a young man in Cimabue's workshop, once painted on the nose of one of the figures a fly, which was so life-like that Cimabue tried several times to brush it off with his hand, under the impression that it was real, before he realized his mistake (Vasari 1987: 80; Gregory and Gombrich 1973).

Physical space rediscovered

The same preoccupation with mimetic realism was applied to the rendition of physical space, where the use of geometric perspective, also initiated by Giotto, injected the painted scenes with a more natural, "photographic" quality. In this Giotto revolutionized representative art because in his Biblical narratives he aimed not so much at doctrinal instruction but more at a dramatic evocation of scenes painted as if viewed by an eye witness. His paintings of interior spaces are already based on geometrical perspective, so that the surface is no longer the wall or the panel bearing the forms of individual things and figures, but rather is once again that transparent plane through which we are meant to believe that we are looking into a space, even if that space is still bounded on all sides (Panofsky 1991: 55). This change of representative style, however, would not have been possible without the doctrinal relaxation, which now allowed for a direct bringing together of

the human and the divine by including a hypothetical human observer in the sacred scene. The novel effect of Giotto's art was a surprise to his contemporaries at the degree of like-likeness his paintings could achieve. For example, Boccaccio (1313–75) tells in the *Decamerone* that Giotto

was a genius of such excellence that there was no thing of nature... that he did not depict with the pencil or the pen or the brush in a manner so similar to the object that it seemed to be the thing itself rather than merely resembling it; so much so that many times the visual sense of men was misled by the things he made, believing to be true what he only painted (Boccaccio 1984: 157).

It is easy for a modern viewer, overexposed to the naturalism of the omnipresent photographic culture, to be less appreciative, even blasé at Cimabue's and Giotto's once revolutionary paintings, but we must not forget that these painters' contemporaries had nothing equally realistic with which to compare the paintings. For similar reasons it is easy to feel condescending towards the technically crude, as judged by today's standards, first motion pictures by the Lumière brothers made in 1895. However, to the original audiences the mere addition of movement to photography sufficed to send the spectators screaming with fear when the train on the screen rushed headlong towards them.

The new naturalism of style in the Renaissance had its ideological consequences, as the implication of the presence of a human witness at a sacred event presupposed a degree of humanization of religion still impossible during the Christian Middle Ages, and even less possible in iconoclastic Judaism and Islam, where not just the image itself but even a suggestion that a human onlooker could be present at a sacred event would have been considered a blasphemy. The divine world envisaged in medieval art was by definition qualitatively different from the human world, which meant that the categories of sensory perception normally involved in negotiating this world did not necessarily apply to the postulated divine reality. This is why medieval painters made little attempt to render space realistically, with three-dimensional perspective, as if to discourage any comparisons between the divine and the human worlds. In medieval pictorial art there is usually little sense of depth, and the relative sizes of figures are disregarded as cues of distance from the observer for the sake of emphasizing doctrinal importance through scale. Thus the figure of the Virgin Mary or Christ will be much larger than the figures of the saints or disciples surrounding them. In pictographic style the sacred event is not depicted with all the detail and complexity found in the empirical world, but in clear and simple hieroglyphics, very much like the conceptual and schematic art of ancient Egypt, which made the viewers understand the doctrine rather than visualize it. In medieval pictographic art there is no pretence of presenting, as Giotto did later, a snapshot of a given scene such as might have

been seen and photographed by an imaginary witness (Gombrich 1982: 21, 88, 156; Gombrich and Hochberg 1972).

Impressive as spatial realism in Renaissance art is when compared with its absence for nearly a millennium during the Middle Ages, its achievement was probably less a matter of artistic genius than of the changed historical and ideological circumstances, in which naturalism in artistic representation of religious figures and scenes stopped being considered inappropriate, doctrinally incorrect or blasphemous. It does not necessarily take a genius to notice that objects appear to diminish in size the further they are situated from the observer, or that the parallel horizontal lines of a road or building seem to converge proportionately to the distance from the eye. It is also difficult to imagine that even before the scientific study of visual perception and geometric perspective anyone would ever believe that an object moving away from the eye was *really* becoming smaller in size. As the physiologist M. H. Pirenne explains, the principle of psychological constancy makes sure that the observer does not perceive the subjectively diminishing object as becoming really smaller (Pirenne 1970: 59). The peculiar stabilizing tendency – promoted by the co-operation of vision with the tactile sense – is what ascribes to perceived objects a definite and proper size and form, and thus tends not to take notice of the distortions which these sizes and forms suffer on the retina (Panofsky 1991: 31). So when Plato says in *The Republic* that “the apparent size of an object, as you know, varies with distance from our eye,” he does not formulate a scientific discovery or a profound philosophic insight, but states a more or less obvious observational fact (Plato 2003: 345). Ernst H. Gombrich may thus be overestimating the difficulty of attaining naturalism of representation in Renaissance art, when he states that “this imitation of visual reality must be a very complex and indeed a very elusive affair, for why should it otherwise have taken so many generations of gifted painters to learn its tricks?” (Gombrich 1982: 12). It certainly required learning new skills and techniques to paint realistically, as evidenced by the development of Florentine painting during a hundred years between Giotto and Masaccio, but just as important was the relaxation of doctrinal constraints on art due to the rise of humanism, which allowed the artists to focus on the “photographic” quality of the painted scenes, and to represent bodies, objects, and space in the way they saw the empirical world around them, rather than as imagined according to abstract religious doctrine.

Revolutionary as the discovery of geometric perspective and anatomical accuracy in Renaissance art was, it was probably not on a par with, say, the Copernican revolution in astronomy. For most people it was very difficult to even consider as a possibility, let alone accept as true, Copernicus’ heliocentric cosmology, because from the point of view of a subjective observer the theory seemed so illogical, uncommonsensical, and unempirical – the idea that the earth that appeared flat and

immovable should actually be a gigantic ball hurtling through space and revolving around the sun. By comparison, geometric perspective in painting was more of an application of a familiar way of looking at things than a discovery of an entirely new and perceptually hard-to-believe phenomenon. M.H. Pirenne demonstrates that a picture made by a representational painter must, at least in some respects, act upon the eyes of the spectator in the same manner as the actual scene he wishes to depict would act upon them (Pirenne 1970: 10). The genius and skill of Renaissance artists notwithstanding, their discovery of naturalism was a bit like realizing: “so now we can paint in the way we actually see the world: cool!” The subject matter was still predominantly religious, as in the Middle Ages, but paintings were gradually ceasing to look like cardboard cut-outs, flat and schematic, and were beginning to resemble two-dimensional *tableaux vivants* of naturalistic, fully human (not just anthropomorphic) figures in period dress, placed in often fanciful and theatrical but geometrically realistic interiors or open spaces.

In fact painting realistically, with perspective, was not that devilishly difficult once artists put their minds to it, and they all did it with relish and enthusiasm. Around 1420 Filippo Brunelleschi solved the problem of realistic perspective following the simple principles of Euclidean geometry. His experiment took the form of a peepshow in which one could see through the eyehole a view of the Florentine Baptistery as seen through the open doors of the Cathedral. He showed that it was possible to work out theoretically and practically what aspect of any object could be seen from any particular point in space (Gombrich 1982: 224). In 1435 Alberti stated in *De Pictura* that “the function of the painter is to draw with lines and paint in colours on a surface any given bodies in such a way that, at a fixed distance and with a certain, determined position of the centric ray, what you see represented appears to be in relief and just like those bodies” (Alberti 1972: 95). To achieve a mechanically correct reproduction Alberti adopted the notion of the visual pyramid, or cone, to explain the optical relation between the eye of the observer and the object at which he looks. He represented that relation by a system of straight lines issuing from each point of the object’s frontal surface and meeting in the eye. The result is a kind of semi-horizontal pyramid, whose apex is at the point of the eye. If this pyramid of light rays is intersected by a plane of glass perpendicular to the line of sight, the image on the glass will be a projection of the object, so that by tracing on the glass the outlines of the object as seen from the point of observation, the viewer can record an exact duplicate of the image. If this procedure is applied to a geometrically simple environment, such as the interior of a church or a fragment of urban space, the resulting image will conform roughly to the rules of central perspective (Kemp 1990: 9–23; Arnheim 1974: 284). Leonardo da Vinci devised a similar method, elaborated by many other Renaissance artists such as

Albrecht Dürer for example, of painting a scene by taking account of foreshortenings to imply depth:

Place a sheet of glass firmly in front of you, keep the eye fixed in location and trace the outline of a tree on the glass.... Follow the same procedure in painting... trees situated at the greater distances. Preserve these paintings on glass as aids and teachers in your work (Hochberg 1972: 49; Bartrum 2002: 219).

Leonardo's window is a surrogate for the scene because it affects the viewer's eye in a way that is similar to that in which the scene itself does. Of course, flat pictures will not cause us to see three-dimensional depth, but even with our two eyes we will not always correctly perceive depth in a real three-dimensional scene, if that scene is viewed with a fixed head from one position in space, or with one eye closed. This means that a painted scene showing correct, photographic perspective is a fairly good approximation to what we actually see in front of us, and will generally evoke instant and effortless recognition, even though what we see extends in depth while painting surface is flat. Leonardo described perspective as the "rein and rudder of painting," and the painter Paolo Uccello is reported to have said to his wife's request to finally come to bed: "Oh, but what a lovely thing this perspective is!" (Vasari 1987: 104).

Perspective has often been called a "convention" which does violence to the way we see the world, almost like all other stylistic conventions, such as the schematic, pictographic style of Egyptian or Christian medieval art, or the cubist or surrealist distortions of perception of early twentieth-century art. Indeed, realistic representation in art is by no means obvious and "natural." As the psychologist of art Rudolf Arnheim observes, the mechanical projection of the visual pyramid leads in fact to radical distortions in the visual understanding of the build of the human body, an animal, a tree or a house. Guided by the optical "correctness" of geometric perspective with its foreshortenings and convergences, artists twisted the axes of objects, destroyed the symmetrical correspondences of parts, altered proportions, and rearranged the relative location of things. In a "realistic" painting a human figure could reach above the trees into the sky, the feet could adjoin the face, and the outline of the body could assume almost any shape (Arnheim 1974: 134). This is why when we consider the emergence of creative thought in the drawings of children, we find that they are conceptual rather than illusionistic in the earliest stages. Illusion of realism does not start until the age of seven or eight, when the child begins to consciously copy from others or from nature itself (Penrose 1973: 282).

However, for all its conventionality mimetic art reinvented in the Renaissance still remains the closest approximation to our natural vision: it only demands that we stand still, look in one direction with one eye closed, and analyse the flat picture

in front of us accepting all its foreshortenings and other distortions. What Gombrich calls the “eye-witness principle” appears thus to be the best method to map precisely what anyone could see from a given point, or what the camera could record (Gombrich 1982: 258, 281). Realistic, perspectival painting is indeed more “natural,” or less conventional from the perceptual point of view, very much like a photograph, which automatically and mechanically flattens three-dimensional space but is still perceived as naturalistic and easily recognizable. David Lewis-Williams writes that the Abelam tribe of New Guinea, unfamiliar with two-dimensional representations, at first had difficulty in “seeing” photographs shown by an anthropologist, but not because the tribesmen were inherently incapable of understanding photographs, but simply because of unfamiliarity with the medium. After some tuition, however, the tribesmen were able to understand the convention of representing depth on a flat surface, and could recognize themselves and their village on the photographs (Lewis-Williamson 2004: 183). Rudolf Arnheim also quotes the experience of a nineteenth-century artist, who was sketching the house of a German peasant while the owner watched him. As the artist was drawing the oblique lines required by perspective, the peasant protested: “Why are you making my roof so crooked – my house is quite straight!” But when he later saw the finished picture, he admitted with surprise: “Painting is a strange business! Now it is my house, just the way it is!” (Arnheim 1974: 115). The relative ease with which anyone can learn the convention of central perspective demonstrates that photographs and realistic paintings remain a close approximation to the natural, unmediated view of reality. For instance in today’s Islamic countries, with their absence of tradition of representational art, people have no problem enjoying family photographs or television programmes. Important as the discovery of geometric perspective was in the Renaissance, the new visual convention was not so difficult to understand once artists realized that they could paint religious scenes as if seen by an imaginary human observer. As Gombrich remarks, the rapid spread of naturalistic style throughout Europe during the Renaissance suggests that the closer the realistic code came to the evocation of a familiar reality, the more easily could the faithful contemplate the re-enactment of the religious story and identify its participants (Gombrich 1982: 23).

Interestingly however, this “easy” and “natural” style of representation was discovered at only one time and place in history (outside classical antiquity), and it came about in response to very particular cultural needs that arose uniquely during the European Renaissance. Paradoxically central perspective, by far the most realistic way of rendering optical space, should be the method suggesting itself most naturally to everyone by the evidence of visual experience, rather than remaining an esoteric refinement reserved to the sophisticated few, hailed as the greatest achievement of Renaissance art. As I pointed out earlier, the achievement

was not due to a unique success in overcoming a technically difficult problem of realistic representation (the problem was not *that* difficult), but due to a combination of unique historical factors that made Renaissance science and humanism possible, and without which it would never have occurred to artists that their task was to create images closely matching what they saw in the real world. The method of tracing faithful images on a transparent surface using the principle of the visual cone, as practised by Alberti, Brunelleschi, Da Vinci, or Dürer, would certainly have been within the range of any reasonably advanced civilization. If nevertheless we have no evidence of this kind, this probably means that there was no demand for such mechanical exactness of representation in civilizations where scientific rendition of space was not invented. Realistic representation of space came as a result of an ideologically motivated shift in the understanding of the purpose of art, which in fifteenth-century Italy included holding a mirror up to nature instead of metaphysical reality. In the words of Rudolf Arnheim:

Central perspective came about as one aspect of the search for objectively correct descriptions of physical nature – a search that sprang during the Renaissance from a new interest in the wonders of the sensory world, and led to the great voyages of exploration as well as to the development of experimental research and the scientific standards of exactitude and truth. This trend of the European mind generated the desire to find an objective basis for the depiction of visual objects, a method independent of the idiosyncrasies of the draftsman’s eye and hand (Arnheim 1974: 283).

Central perspective makes the picture’s central axis coincide with the viewer’s line of sight, and by explicitly acknowledging the viewer it becomes a supreme manifestation of Renaissance individualism and humanism. In this way realistic perspective nobilitated the subjective, human, and empirical visual impression, while its scientific principles translated psycho-physiological space into painted space with mathematical exactitude. Renaissance art may thus be said to have largely returned to a function it fulfilled in Greece of the classical period. It was still mainly religious in character, but its role was not just to tell the sacred story to the illiterate but rather to evoke it in a convincing and imaginative way to those who already knew it. As Vasari repeatedly emphasizes in his *Lives*, the artist’s mastery in conveying human emotions now comes to the fore, so that the illustration of a sacred story becomes more of an occasion for the exercise of such a mastery. It was the “how” and not the “what” that art connoisseurs admired and pondered. What was revolutionary about Renaissance art was that without losing its religious character it began to acknowledge and delight people rather than serve the invisible god; in other words, art humanized religion.

Photography and the decline of realism in painting

Linear perspective and naturalism of representation introduced and perfected by Renaissance art defined the artistic style of the subsequent centuries in Europe, initiating a tradition referred to as “classicism,” with its implication of original inspiration by the art of ancient Greece and Rome. Classicism thus understood drew to a close towards the end of the nineteenth century, not because of the return of religious dogmatism but, to the contrary, because European culture became more secular than ever, and had just invented the most realistic methods of visual representation in the form of the photographic media.

Since the Renaissance visual art had been pushing towards realistic, objective representation of the world, a goal that corresponded exactly with the essence of photography. Even before the nineteenth century cityscape painters such as Canaletto, aided with the camera obscura, injected scientific precision and quasi-photographic accuracy in their highly objectified representations of reality. The artistic movement referred to as Realism, launched in France in 1855 at the World’s Fair and Industrial Exposition, was no doubt partly influenced by the growing popularity of the photographic copies of nature. As the historian of photography Gisèle Freund points out, the positivist aesthetics of the first Realist painters, as represented primarily by Gustave Courbet (1819–77), was indistinguishable from the aims and practice of photography. When Courbet declared that “painting is an art of sight and should therefore concern itself with things seen,” he was inadvertently referring to what the camera was doing (Freund 1980: 71). The Realist programme demanded of painters to develop a totally impersonal attitude toward nature, and to abandon artistic pretences by thinking of themselves merely as skilled craftsmen. Their aesthetic equation of visual reality with the reality of nature was also the premise of the photographer, for whom reality in nature was defined only by the optical image produced by the camera. The resulting picture could only reproduce what the photographer saw. Imagination had little role in his work, which consisted only in choosing the subject matter, evaluating the best way to frame it, and selecting the pattern of light and shadow. The photographer’s work thus ended even before the shutter clicked.

The mechanical and almost automatic nature of the photographic process, compared with the deliberate and thought-out character of traditional painting with its dependence on the artist’s imagination, intellect, and skill, was what at first prejudiced the established artistic world against the new medium. The Academician Jean-August-Dominique Ingres (d. 1867), for example, found photography despicable and its practitioners the desecrators of the “sacred temple of art.” Similarly, for the poet Charles Baudelaire (d. 1867) photography was a form of industry that had nothing in common with art, but was simply an “invention resulting from

the mediocrity of modern artists and a refuge for all unsuccessful painters” (Trachtenberg 1980: 94). In 1858 the poet Alphonse Marie Louise de Lamartine condemned photography as a “chance invention which will never be art, but only a plagiarism of nature through a lens.” However, after seeing the photographs of Antoine Samuel Adam-Salomon, who carefully used light effects to enhance contours and plasticity of the photographed image (usually portraits), Lamartine changed his mind and wrote that photography is “more than an art; it is a solar phenomenon in which the artist collaborates with the sun” (Freund 1980: 77–79). Indeed, while most serious artists denied the artistic merits of photography, the *juste milieu* painters were enchanted by the new technique. Upon seeing the first photographs Paul Delaroche, a historical painter of the Academie Française, is reported to exclaim: “From today, painting is dead.” In a letter of 1839 to the scientist Françoise Arago Delaroche asserted that

this new medium reproduces nature not only truthfully but also artistically. The lines are correct, the forms are exact – all is as precise as possible. A composition as rich in tone as in effect... When this technique becomes widespread, the most accurate picture of any scene will easily be obtained in a few moments (Freund 1980: 81).

Unable to compete with photography in the field of realism, visual art from the end of the nineteenth century onwards turned decisively towards non-realism, or at least away from the kind of “photographic” realism invented in the Renaissance, by introducing new ways of rendering space and the human body. As noted by Susan Sontag, “by taking over the task of realistic picturing hitherto monopolized by painting, photography freed painting for its great modernist vocation – abstraction” (Sontag 1978: 94). Painting’s first radical departure from photographic (black-and-white) realism came with the Impressionists who, in the words of the painter-photographer László Moholy-Nagy, “were the first to give colour back to civilised man” (Moholy-Nagy 1969: 19). The next important departure from post-Renaissance naturalism came with Cubism and its changed perception of the human form, of objects in general, and of physical space, as exemplified by Picasso’s painting *Les Femmes d’Alger* (1911). Together with Georges Braque, Picasso abandoned traditional notions of perspective, foreshortening, and modelling, in a desire to represent solidity and volume in a two-dimensional plane without converting the flat canvas illusionistically into a three-dimensional picture-space. Insofar as they represented real objects, the Cubist painters aimed at depicting them as they are known and not as they partially appear at a particular moment and place from a particular viewpoint. For this purpose they combined views from several angles in the same whole, as if to give a more complex, and therefore probably “truer” view of an object. Many different aspects of the object might be

depicted simultaneously, as in showing the female form dismembered and re-assembled in a manner that allows the viewer to see back and front at the same time. The technique implied not only an acquired knowledge of the object, but also the movement of the observer around the object. In this sense Cubism was still to some extent realistic, but it was a conceptual realism rather than optical or Impressionistic realism. Cubist painters did not depict objects photographically, from a fixed point of view, but imaginatively complemented the visible elements with what the eye did not see but what the painter knew was there.

In evoking depth on a two-dimensional surface the Cubists at first denied themselves the well-tried techniques of linear perspective. Their compositions were deliberately shallow in depth, constructed with the same limitations as sculpture when it is compressed into a bas relief. The result was that the painting had the appearance of a compact object existing in its own right. In this respect, with the image obscured by the analytical process of dissection and systematic reconstruction, Cubist paintings became related to African tribal art, or even to the “conceptual” image of medieval art. Eventually, as the art historian Roland Penrose observes, Cubism retraced its steps back to a more easily recognized relationship with the objective world. Picasso’s and Braque’s work from the 1920s re-introduced a greater sense of depth and other representational elements. For example, Picasso’s *Mandolin and Guitar* (1924) depicts the schematized but recognizable musical instruments, a table, a room, and an open window with a view of clouds in the sky. The objects are distorted but identifiable, and they interlock with their shadows and intervening spaces in such a way that they appear to be solid objects united by clear, semi-realistic spatial relations (Penrose 1973: 257).

Freed from the post-Renaissance expectation to serve as a mirror up to nature, twentieth-century painting subsequently took off in a number of unpredictable experimental directions, eventually to become an elitist art form, leaving mainstream visual culture to the more democratic and naturalistic photographic media. As evidenced by photojournalism, family photographs, book illustrations, film, television, video and DVD, the indexical medium of photography became the prototype for much of popular and commercial visual culture, relegating the traditional iconic media of painting and sculpture to galleries, museums, and private, elitist collections. The characteristic form of traditional fine arts is its uniqueness and individualism, whereas the modern photographic media, with their cheap, easy, and fast duplication of images, are essentially democratic and populist. Traditional arts also rely on the distinction between authentic and fake, between original and copy, between professionalism and amateurism, between good taste and bad taste, while the modern media blur or abolish these distinctions. Even photography’s huge educational role in disseminating traditional works of art by means of printed reproductions has the side effect of devaluing art, precisely

by turning a rare commodity into something common and perhaps too easily accessible. Before the invention of photography artworks had been accessible only to an elite few; when paintings could be reproduced by the millions, art became available to everyone. Despite the fact that photography misrepresents a work of art by distorting its dimensions, often depriving it of colour, and reducing a sculpture to a two-dimensional image, it has been, on balance, immensely helpful in removing art from its elitist isolation and in democratizing it (Friday 2002: 60).

At the same time, the over-saturation of our living environment with innumerable images, static and moving, constantly competing for our attention through billboards, posters, public signs, book covers, colour magazines, leaflets, shop window displays, mobile ads, television, cinema and theatre, to say nothing of traditional museums and galleries, has the inevitable effect of numbing our visual sensitivity. There is only so much attention that individual viewers can devote to the visual stimuli surrounding them, and with so much to look at the inescapable result is to spread that attention more thinly, losing the concentration required to absorb the full informational content of any single image. Gone therefore is the deep suggestiveness and emotive, even “magical” power of images characteristic of pre-industrial cultures with their relative scarcity of secondary visual representations. In a society where the only man-made images are religious paintings in a near-by church, their contemplation, especially in the spatial context of the church’s architecture and the emotionally heightened atmosphere of the ritual, can produce a more powerful aesthetic effect than the ephemeral, constantly changing images that bombard us from everywhere during our waking hours in our post-industrial, media-saturated environment. Of course the choice is much wider now, but we have to exercise more self-control in focusing our attention selectively on some images while ignoring others, to avoid becoming desensitized and blasé about an important part of Western culture.

Why we enjoy pictures

Despite our over-exposure and habituation to intense and varied visual stimuli, our attention and sensitivity to man-made images are never likely to disappear, firstly because sight is by far the strongest, most efficient sense in humans, and secondly because of our species-specific fascination with secondary visual representations, often at the expense of attention paid to primary representations. Strange as it may seem, in certain situations iconic signs, which are part of indirect communication, can be preferable to contiguous signs, which belong to direct communication. Commenting on the growing popular culture Henry James pointed out in his 1890 short story *The Real Thing* that mass media encouraged the

general public's "perversity – an innate preference for the represented subject over the real one" (James 1945: 194). Over two centuries earlier the philosopher Blaise Pascal also remarked: "What vanity is painting, which attracts admiration by the resemblance of things the originals of which are not admired" (Pascal 1985: 189). In the early fifteenth century the Byzantine philologist Manuel Chrysoloros addressed the same question at greater length:

Why is it that when we see a live horse or a dog or a lion (as we may do every day), we are not roused to admiration, are not delighted by its beauty and attach little value to its appearance – and the same applies to a tree, a fish, a cock and even to human beings... – but when we see the picture of a horse or a bull or a plant or a bird or a man, or even of a fly, a worm, a mosquito or some other foul animal, we are greatly moved by the sight of such pictures and make much of them?... we neglect the existing models for all their beauty, while we admire their representations.... Furthermore, it is not considered shameful to gaze upon the beauty of statues and paintings (on the contrary, this indicates a certain nobility of spirit on the part of the admiring spectator), whereas to gaze upon beautiful women is a licentious and shameful act. What is the reason for this? It is that in images we are admiring the beauty not of bodies, but of the maker's mind (Mango 1972: 254).

The apparent preference for secondary representations (in certain situations) seems paradoxical, considering the adaptive importance of responses to contiguous situations: a painted or a well photographed lion can be aesthetically preferable to a real one, but it obviously pays in survival term to exert fully our attention to a live predator in our vicinity. The alertness and emotional arousal caused by real threat cannot therefore compare in intensity with a mere thrill or passing interest in watching animal predators on paintings, photographs, or in television nature films. At the same time what probably motivates our interest in pictures is that well executed, aesthetically appealing secondary representations give us the thrill of emotion and excitement of surrogate experience at no real cost in terms of serious life consequences or risk to our life or safety. As Oscar Wilde said, "Art does not hurt us. The tears we shed at a play are a type of the exquisite sterile emotions that it is the function of Art to awaken. We weep, but we are not wounded. We grieve, but our grief is not bitter," because "emotion for the sake of emotion is the aim of art, and emotion for the sake of action in the aim of life" (Wilde 1994: 1135).

If contiguous emergency is what for adaptive reasons alerts our senses, lack of immediate threat or emergency has the effect of numbing our sensitivity to ordinary, repetitive, and therefore familiar stimuli, often to the point of making us ignore them altogether, despite the fact that objectively speaking there is nothing "ordinary" about anything that surrounds us. Seen from a less desensitized perspective our immediate living environment, and by extension the wider world, the phenomenon of life in it, the existence of the human species and the universe are

nothing short of a miracle. Over-familiarity may dull both the senses and the intellect but, as André Gide said, “a wise man is astonished at everything.” On the other hand secondary representations seem to attract our attention for reasons other than immediate threat or emergency. First of all, as the Byzantine scholar quoted above suggests, in admiring images we do not admire the represented objects themselves but “the maker’s mind.” In other words works of art, iconic as they are in relation to the objects they depict, are indexical in relation to their authors’ talent, skill, and imagination – all manifestations of exceptional cognitive abilities which we are innately predisposed to appreciate in fellow humans. Also, as I argued in the previous chapters, secondary images such as paintings, photographs, or film constitute spatio-temporally displaced signs that activate our specifically human meta-cognitive faculties, offering a compelling illusion of control over the represented objects, based on the instinctive desire, underlying the homeopathic magic, to deny the working of time by subjectively converting contiguous signs into temporally displaced icons. Temporal or spatial separation between image and original uncouples stimulus from response, rendering dangerous objects harmless and more “under control.” The painted lions from the Chauvet cave, awesome as they may look, are “tame” compared with their displaced live equivalents, just as the petrifying gaze of Medusa is disarmed by being displaced through the reflection in Perseus’ magic mirror.

Another possible reason why we find secondary representations attractive is that their informational content is usually of a different kind than that of the surrounding environment, precisely by virtue of being mediated by the artist’s vision and skill rather than created spontaneously by natural laws. A work of art, even the most realistic one, is always in some important respects uncannily different from the object it represents. For example, a live moving human figure or animal is presented in a painting or a photograph as unnaturally and eerily still, giving the viewer an opportunity, unavailable in relation to a live object, of examining the object closely and for as long as the viewer wishes. Moreover a painting, a well composed photograph, a theatrical play or a scripted and edited film communicate information with a concentration and structure far above what, on average, surrounds the viewer in the spontaneous, uncontrolled flux of life. The prehistoric cave paintings contain a far greater concentration of animals of different species in a given space than can possibly be encountered in real life. Carefully selected and thoughtfully arranged visual elements within the limited space of a panel painting can also create meaningful tensions lacking in a haphazard arrangement of objects normally surrounding us in our living space, just as dramatic tension in a play or film offers a version of life experience far exceeding the emotional intensity and concentration usually found in our daily, and for the most part dramatically uneventful lives.

CHAPTER 9

Linguistic iconicity and the limits of arbitrariness

One of the general points I make in this book is that types of communication, as distinguished in Chapter 2, appear to form an evolutionary hierarchy based on the increasing complexity of cognitive processes involved in exchanging information and producing meaning. In the simplest case a direct physical interaction between spatio-temporally co-present systems is the basis of contiguous communication, which can exist on its own (as in animal communication), but is also a prerequisite of indirect communication, that is, communication involving displaced referents (as in much of human communication). The simplest form of indirect interaction between spatio-temporally separated systems is by means of a physical change produced by the sender in the environment – what I called indexical communication. Another type of indirect interaction between spatio-temporally separated systems is by means of a physical change produced by the receiver in the environment, in which the change physically resembles the sender – what I called iconic communication. Finally, I distinguished another type of indirect interaction between spatio-temporally separated systems, also by means of a physical change produced by the receiver in the environment, except that this time the change does not bear any perceptual resemblance to the sender, but only refers to it in an abstract, arbitrary way. The arbitrary, structurally non-equivalent relation between original and image is correspondingly the basis of symbolic communication, while a physical change produced by the receiver in the environment and referring to the original is called symbol.

As Terrence Deacon also reminds us the indexical, iconic, and symbolic forms of reference reflect a classic philosophical trichotomy of possible modes of associative relationship: physical correlation, similarity, and law or convention, respectively. The great modern philosophers of mind such as John Locke, David Hume, Immanuel Kant and others had each in one way or another argued that these three modes of relationship describe the fundamental forms by which ideas can come to be associated. The philosophic trichotomy with its ascending order of associative relationships also lies at the basis of Peirce's hierarchic semiotic triad of icon-index-symbol, in which more complex forms of reference are built upon simpler forms. Deacon tacitly accepts Peirce's sequence of icon-index-symbol, with its

implication of increasing complexity of referential competence: “indexical reference depends upon iconic reference, and symbolic reference depends upon indexical reference” (Deacon 1997: 70, 74). However, I want to argue that if referential competence is to reflect the evolutionary complexity of the nervous system, indexical communication should probably come first (as a spatial extension of basic contiguous communication), followed by iconic communication (already presupposing a more advanced organism capable of “imagining” an external object), before we can talk about symbols with their perceptual indifference to objects or concepts they refer to. The simplest autonomous systems, such as single-celled organisms, interact with their environments solely through contiguous mechanical forces and through contiguous indexes in the form of secreted chemical substances. By comparison iconic communication, even in the form of primary representation, is only available to animal organisms equipped with “concepts” as generalized representations of adaptively important elements of the environment, accumulated in the animals’ brains by trials and errors of natural selection. As I demonstrated in Chapter 7, human higher-order consciousness makes it possible to translate primary representations into secondary representations in the form of spatio-temporally displaced material iconic images of art. Icons cannot therefore precede indexes in the evolutionary sense; rather, the reverse is more likely the case, as is even reflected (intuitively and correctly in my view) in the earlier-cited classical myth of the origin of portrait painting (icon) from a person’s shadow (index). If this evolutionary sequence is correct, symbols will be expected to have arisen from icons rather than from indexes.

Defining symbol

For Peirce, “A *Symbol* is a sign which refers to the Object that it denotes by virtue of a law, usually an association of general ideas, which operates to cause the Symbol to be interpreted as referring to that Object” (Peirce 1998: 143). The “law” that Peirce mentions in his rather vague definition is what is usually referred to as social convention, a specifically human, culture-related capacity to establish and socialize an arbitrary, perceptually unmotivated, spatio-temporally displaced connection between sign and its meaning (Saussure 1974: 67; Sebeok 1976: 45; Deacon 1997: 71; Bertalanffy 1981: 44). Thus understood arbitrariness is the cornerstone of Ferdinand de Saussure’s structural linguistics, which on the one hand stresses the social nature of the linguistic sign (in the sense that it is not created by an individual speaker but by a linguistic community), and on the other hand it highlights the arbitrary, unmotivated character of the sign, which “has no natural connection with the signified (i.e. meaning)” (Saussure 1974: 69, 113). By contrast,

indexes and icons do possess a natural connection with their originals (contiguous and pictorial, respectively), and it is this non-arbitrary origin that determines and delimits the outward appearance of these types of signs. On the other hand, in the case of the arbitrary sign the outward form (image) becomes irrelevant, because it has no natural connection with its referent (original), and in itself it does not suggest what the sign is referring to.

But if the form of the sign does not suggest the sign's meaning, how is meaning produced and communicated, in human verbal language for example? Structural linguistics tells us that meaning is generated not by signs alone, because their arbitrary nature precludes any inherent semantic value, nor even by concepts as the signs' mental equivalents, but by *relations* between signs; more specifically, by perceptual differences between signs, because the source of the signifying power of signs, we are told, is solely the linguistic system to which they belong. In other words, for structuralists meaning lies neither in the physical form of the sign, nor inside the speaker's mind, nor is it produced as an interaction between the two, but is determined only within the linguistic system itself by the sign's opposition to other signs. This effectively implies that linguistic meaning has nothing to do with the speakers' minds and behaviour, because it is generated in the meta-sphere of a linguistic system existing independently from individual speakers. For Raymond Tallis this *de facto* "denial of the pre-linguistic reality of the signified" is the most revolutionary and controversial aspect of Saussure's theory. In structuralist thought the meaning (signified) is not a "thing" "out there," nor is it a pre-linguistic psychological entity: rather, the signified is purely relational (Tallis 1999b: 274; Saussure 1974: 117). Arbitrary signs, the only type of signs that structuralists appear to be interested in, thus exist independently both from human minds and from the external, extra-linguistic world.

This indeed looks like a revolutionary view of communication, one that in some important respects contradicts what I said in the earlier chapters about the psychological and adaptive function of signs and their role in the social exchange of information about important facts of life; that is, facts existing "out there" beyond language. But does the notion of the arbitrariness of the linguistic sign really justify the conclusion that language forms a closed semantic system, unrelated to the extra-linguistic reality and to human experience? And what about an even bolder and in fact improbable structuralist claim that human mind and thinking are solely determined by arbitrary linguistic signs unconnected with the external, physical world. According to Saussure:

Psychologically our thought – apart from its expression in words – is only a shapeless and indistinct mass... without the help of signs we would be unable to make a clear-cut, consistent distinction between two ideas. Without language, thought is

a vague, uncharted nebula. There are no pre-existing ideas before the appearance of language (Saussure 1974: 111).

It is an amazing and in fact largely unproven assertion, impossible to accept today, especially in view of the well-documented evolution of human communication from contiguous interactions with the environment, through indexical and iconic signs, all of which Saussure's structuralist theory appears to ignore, proposing instead a truly "arbitrary" and indeed unsubstantiated view of language as a *deus ex machina*, miraculously springing out of nowhere, fully formed, connected with nothing except itself, unrelated to evolutionary earlier forms of communication, and taking full possession of the human mind that has allegedly nothing else at its disposal with which to negotiate the world.

Indexical features of language

Nor did Saussure himself invent the idea of "l'arbitraire du signe." The arbitrariness of all linguistic signs was first formulated two centuries before by John Locke, who wrote in *An Essay Concerning Human Understanding* (1690) that words are signs of their ideas "not by any natural connection... but by voluntary Imposition" (Locke 1978: 67). In twentieth-century linguistics and linguistics inspired literary and cultural studies, the arbitrariness of the linguistic sign has acquired the status of a dogma, in which language is perceived as a closed and autonomous semiotic system with its own internal determinants of meaning independent from the extralinguistic world (Nöth 2001: 17, 25). However, despite its popularity and influence within academia, the structuralist claim remains a non sequitur: namely, while it is true that all linguistic signs have arbitrary features, it does not automatically follow that no linguistic signs have non-arbitrary features. As the linguist Earl R. Anderson points out, the Saussurian analysis of meaning was incomplete from the beginning because it ignored important and ever-present iconic and emotive (indexical) dimensions of language, present in it as residues of the evolutionary earlier, pre-linguistic forms of communication (Anderson 1998: 67; Willems and De Cuyper 2009).

Interestingly, unlike his structuralist and poststructuralist followers Saussure himself qualified the concept of the arbitrariness of linguistic signs by conceding that there are "degrees of arbitrariness," and that the sign may be "relatively motivated" (Saussure 1974: 131). First of all, grammar and inflections impose partial motivation, whereby phonemic allusion can betray semantic proximity, as for example in the phonetic closeness of kinship terms: the English *father-mother-brother-sister*, or the French *père-mère-frère*. In fact, Saussure calls the principle of the

arbitrariness of the sign “irrational,” granting that “there is no language in which nothing is motivated” (Saussure 1974: 133). Like the other types of signs used by humans: contiguous, indexical, and iconic, symbolic linguistic signs are a product of cumulative evolution, which means that their arbitrariness is built upon earlier, non-arbitrary features, still present in language on the level of phonology, morphology, and syntax.

In Chapter 4 I argued that primate emotive vocalizations and early human bodily adornments represent a transition from fully contiguous communication to contiguously indexical communication, whereby vocal signals and bodily modifications externalize by making audible or visible the inner physiological and emotional states. Bodily symptoms, cues and signals already involve some spatial displacement between original (an unseen inner state) and image (outward bodily expression or vocalization), as such representing an early form of referentiality. Among the most typical human pre-linguistic, innate emotive vocalizations are laughter (symptomatic of joy), shouts of derision, cry of pain, growl of anger, gasp of astonishment, cooing in intimate situations and so on. Following the evolutionary and cumulative view of communication, whereby the later forms build upon the earlier ones, one would expect both the emotive (indexical) and iconic vocal features to be co-present among the more recent arbitrary elements of the spoken language.

The most archaic human auditory signals are indeed emotive vocalizations, indexical in respect of the speaker’s emotional and physiological states, and consisting of such familiar expressions as interjections, grunts, moans, cries, whistles, clicks, coughing, hiccupping, laughing, expressive intonation and so on (Hinton, Nichols and Ohala 1994: 2). These vocal signals are usually part of a more complex visual-auditory display including bodily posture and facial expression (smiles, frown *etc.*), by means of which humans and other primates communicate such attitudes as dominance, submission, appeasement, threat or sexual arousal (Knight 1999: 229). Visual and auditory emotive displays have arisen in the course of evolution as communicative responses to adaptively important life situations such as encounters with predators and human enemies, search for food, mating, rearing of offspring, social bonding and so on. As an archaic system of symptomatic communication human emotive language is related to the vocal calls of primates (e.g. chimp pant hoots), and is controlled by phylogenetically old, subcortical neural structures in the brain stem and limbic system, heavily involved in emotion (Hauser 1998: 196; Pinker 1995: 365). Emotive signals are both non-iconic, in the sense that an expressed emotion does not “resemble” the situation that caused it, and non-arbitrary, in that the connection between vocal expression and the corresponding emotional state is not based on learned social convention but is innate and more or less automatic. For this reason emotive language is common to all humans, revealing cross-cultural intelligibility: for instance, cries of fear, anger, or

joy are correctly identified as such regardless of race or culture (Badcock 2000: 121). Familiar to everyone but rarely the subject of linguistic analysis, emotive vocalizations hover around the margins of conventional phonology, although they are effectively exploited in comic strips and cartoons with their onomatopoeic and exclamatory expressions (Crystal 1995: 250; Aitchison 2000: 13).

Communicating factual knowledge about the outside world may be the evolutionary *raison d'être* of language (the structuralist claims to the contrary notwithstanding), but at least as strong a case can be made for human innate social need for affective expression as the essential motivator of language. The linguist Edward Stankiewicz argues that some vocal sounds are for historical, linguistic or extralinguistic reasons believed to be emotive, by carrying pleasant or unpleasant connotations. For example, /r/ was considered by the Romans a "littera canina," just as the letter "f" is considered by the Russians "indecent," to say nothing of its place in the main English swear word (Pinker 2007: 354–362). The phonemes which occur with a high statistical frequency in emotionally charged words may also become associated with their emotive content, as for example the Spanish /č/ in word-initial positions, as in *chico*, *chaparron*, *chasco*, *chillar* (Stankiewicz 1972: 244). As Roman Jakobson also notes, experiments with English speakers have revealed a consistent emotive association of the liquid phoneme /r/ with "roughness," "strength," "heaviness" and "bitterness," while the other liquid /l/ was perceived as "tame," "peaceful," "smooth," "light in weight," "clear," "weak" and so on (Jakobson and Waugh 1987: 187). In different languages (Yiddish, Basque, Russian, Polish, some American Indian languages) expressive palatalization is used in affectionate speech, for example in address to children, in child-speech, and in nursery songs, possibly because the vowel /i/ and the semivowel /j/ involved in palatalization are high-frequency sounds, iconically associated with smallness and infantilism (Stankiewicz 1972: 249). Earl R. Anderson also mentions the phenomenon of paraverbals – emotive noises used in everyday speech that have no grammatical function (since they do not combine with other morphemes). Paraverbals are composed variously of voiceless vowels, voiceless nasals, ingressesives, clicks, tones, phonemic glides, vowelless syllables, and consonant clusters like initial [ts-] or [ps]. Paraverbals exist outside the parameters of the morphological rules of the language, but can in time undergo grammaticalization, as for example *psst*, *sh*, *shush*, *brrr*, *ha*, *huh*, *ugh*, *ah*, *phew*, *phooey*, *ahem*, *aha*, *tut tut*, *oh-oh*, *humph* and so on (Anderson 1998: 124).

Practically every word can be endowed with emotive connotations if it is placed in an appropriate social situation or verbal context. Even speechlessness is proverbially the most unmistakable sign of emotion. Depending on the context, emotionally neutral words or even nonsense words may acquire pejorative or affectionate connotations, as when an American mother calls her child *monkey-face*,

pussycat, *cookie*, *honey-bun*, or *sugar-plum*. Features such as alliteration, rhyme, patterned variations of vowels or consonants can heighten the cohesion and uniqueness of the message, and can contribute to its emotive intensity, particularly if the message also has a conceptually emotive charge. For example, the Polish expression *kuku na muniu*, meaning “to be crazy,” owes its expressive effect (apart from its content) to the diminutive form *muniu* (from *mózg*, “brain”), and to the repetition of the back vowel /u/. Connotations of irony or sarcasm are also conveyed through word-pairs, found for example in Yiddish where any initial consonant may be replaced, and the initial vowel preceded, by the cluster /shm-/, as in *libe-shmibe* (“love”), *mojre-shmojre* (“fear”). This phenomenon has passed (perhaps through Jewish humorists) into English, as exemplified by the sarcastic *money-shmoney*, *confusion-shmoosion*, *Oedipus-shmedipus*.

Code-switching or the speaker’s selection of elements of foreign, dialectal, substandard or more archaic forms of language is another source in the rendering of emotional attitudes. The wide diffusion outside original languages of such emotionally charged words as Spanish *loco* and *macho*, Yiddish *meshuge* and *chutzpah*, or Italian *basta* testifies to the emotive power of foreignisms and to the constant need of members of a speech community to replace their own words, paled through usage, by fresher, more “exotic” and emotionally more striking expressions, as exemplified by the “soppy French phrases” used by Del Boy, the endearing and ridiculously snobbish would-be yuppie from the BBC classic sitcom *Only Fools and Horses*. The “exotic” features of foreign languages, like behavioural peculiarities of foreigners, tend to provoke strong emotional reactions, and when imitated they may serve to express irony, contempt, derogation, or at times favourable attitudes. Sounds or grammatical forms alien to one’s own language are known to have been interpreted as affectation, as febleness of mind, as decadent, or, on the contrary, as signs of elegance, confidence, or snobbery (Stankiewicz 1972: 239, 245–247, 252). In real life as well as in life-simulating drama, the explicit informational content coded in the arbitrary elements of spoken utterances is also nearly always complemented by such implicit, connotative, emotionally charged non-arbitrary auditory features as timbre, intonation, pitch and volume.

The emotive features of language and music

Emotive elements of language are mostly indexical and non-iconic, in the sense that their outward expression bears no formal resemblance to the emotional states that elicit them, but in actual linguistic performance the emotive signs usually blend with the more representational, iconic features that mimic their referents. Volume, rhythm and pitch are among such iconic auditory features of language,

also found in music, where they quantify the intensity of communicated emotion (Marler 1977: 52). In spoken language as well as in music, the louder the signal the more emphasis is given to whatever emotion is being expressed; the softer – the less emphasis (Sloboda 1985: 59). Rhythm and tempo in turn add emphasis onto particular phonemes or notes within a tonal sequence, qualifying the particular emotion expressed. Finally pitch, the “up-and-down” dimension of speech and music, is used to grade the emotive quality of sound frequency: rising pitch is universally described as active, assertive, affirmative, aggressive, striving, protesting, aspiring, generally “outgoing,” while falling pitch is considered relaxed, yielding, passive, assenting, welcoming, accepting, enduring, generally “incoming” (Ohala 1994; Mithen 2005: 92). Universally in human languages there is also a statistical tendency for vocal sounds of low frequency to relate to objects that are large, heavy, hard, masculine, low, slow, and dull, and for sounds of high frequency to connote small, light, soft, feminine, high, fast, and sharp objects (Anderson 1998: 102). The iconic value of pitch is also used in animal communication, where the frequency of the produced sound is negatively correlated with the weight of the vocalizer, thus indirectly indicating the animal’s size. Larger individuals will have relatively lower pitched voices than small individuals, and therefore lower pitch will be correlated with size and consequently with strength and dominance. Universally in mammalian kingdom, including human vocal displays, aggressive vocalizations are low in pitch, while submissive vocalizations are relatively high in pitch (Hauser 1998: 19, 177, 476). Thus larger and aggressive animals bellow, growl and roar, while smaller, submissive and fearful animals squeal and squeak. In situations of domination and subordination pitch can also be combined with equally iconic volume, whereby louder voice will express assertiveness and aggression, while softer voice will indicate fear and submission.

As Steven Mithen also observes in relation to primate vocalizations, one of their important features is their musical character, in the sense of making substantial use of rhythm and melody, involving also synchronization and turn-taking. Mithen argues that it is from the holistic, emotive, manipulative, multi-modal, and musical characteristics of ape communication systems that human language and music ultimately evolved from common ancestors about six million years ago in Africa (Mithen 2005: 121). It is a universal of human nature that we respond emotionally to music, especially in groups. As also argued by Robin Dunbar, the emotional response to music is archaic, controlled by the evolutionary old limbic system, and it long predates the evolution of language (Dunbar 2005: 132). The evolutionist Geoffrey Miller also links the complex and creative acoustic displays among animals and humans to sexual selection: accordingly, acoustic signals function as courtship displays to attract sexual partners, by advertising the performer’s health and intelligence, generally fitness (Miller 2000a: 356).

Both spontaneous emotive vocalizations and structured, conventionalized music are basically emotive and manipulative rather than referential or communicative in function. For instance, there is the commonly held idea that major scales in music express positive emotions such as joy, confidence, love, serenity and triumph, while the minor scales express negative emotions such as sorrow, fear, hate and despair, although it is not clear yet whether these correlations are indeed universal. Steven Mithen quotes an experiment conducted by the psychologist Patrik Justin, in which musicians were played five different melodies and were told to choose emotions appropriate to them. The result showed considerable concordance among the musicians, indicating that distinct styles of playing were associated with specific emotional expressions. Thus *anger* was associated with fast tempo and legato articulation; *sadness* with slow tempo, legato articulation and low volume; *happiness* with fast tempo, high sound level and staccato articulation; and *fear* with a low sound level, staccato articulation, and a slow tempo. Also, Justin found a very strong correlation between the emotion intended by the musicians and that which the listeners believed was being expressed. Moreover, the listeners who were trained musicians had no greater success than those without expert musical knowledge in attributing emotions to different melodies, and – interestingly – women had slightly greater success than men (Mithen 2005: 93).

Phonetic iconicity

The emotive and iconic features of animal vocal signals are still exclusively employed in the service of contiguous communication, mainly to convey current emotive states and intentions. On the other hand, in humans linguistic iconicity reveals a much wider and richer scope, in mimicking not just the contiguous emotive and physiological states but also the spatio-temporally displaced objects and events. Just as consciousness and extended working memory were the cognitive prerequisites for the emergence of visual arts, with their permanent iconic representations of remembered objects, so the same uniquely human cognitive dispositions will be expected to produce displaced iconic representations of relevant external objects and situations by means of the auditory medium of language (Herlofsky 2001: 58).

The easiest way to re-present certain objects and events through displaced auditory signs is to mimic the sounds they produce. Indeed, according to the linguist Leanne Hinton onomatopoeic vocalizations (to use just English examples: *bang, cough, cuckoo, murmur, splash, sizzle, scrape, tap, pop, crash, crunch, groan, purr, squeak, roar etc.*) are the simplest, the most widespread, and probably the earliest auditory iconic signs – primitive names for objects or events in the form of an

imitation of the sounds produced by them (Hinton, Nichols and Ohala 1994: 3). In pre-symbolic, mimetic culture vocal imitations of animal and environmental sounds would have very good uses, particularly in a hunting-gathering culture that lacked speech. Simulated bird calls and animal cries are still used in hunting throughout the world. Among the Huambisa people of the Peruvian rainforest, for example, a third of the names for the 206 kinds of birds they recognize are onomatopoeic in origin (Donald 1991: 184; Mithen 2005: 169).

Onomatopoeic expressions are often conventionalized into language-specific grammatical forms, for which reasons they have been incorrectly included by structural linguists among arbitrary signs (Saussure 1974: 56). Thus for example the *snip* of a pair of scissors is *su-su* in Chinese, *cri-cri* in Italian, *riqui-riqui* in Spanish, *terre-terre* in Portuguese, *krits-krits* in modern Greek. The *quack* of a duck is *couac-couac* or *coin-coin* in French, *cuac-cuac* in Spanish, *qua-qua* in Italian, *kva-kva* in Russian, *cac-cac* in Vietnamese, but *mac-mac* in Romanian, *ga-ga* in Japanese, *bat-bat* in Arabic, *ya-ya* in Mandarin Chinese, *ap-ap* in Cantonese (Anderson 1998: 130). Saussure was the first to argue that translinguistic differences among onomatopes prove that these supposedly imitative forms actually are conventional (Saussure 1974: 69). Indeed they are, but as Earl R. Anderson points out, arbitrary features of language do not preclude the co-presence of non-arbitrary, iconic features, because onomatopoeia depends upon necessarily *partial* resemblance to its referent, not upon complete identity. Since no human can imitate non-human sounds exactly due to the constraints both of the language-specific phonological system and of the structure of the human vocal tract, one should not expect identical onomatopes in different languages. A cow goes *moo* in English, *muh* in German, *boe* in Dutch, *meuh* in French, and *ammu* in Finnish. Iconic signs, as partially resemblant forms, are thus composed of both arbitrary and non-arbitrary features. Nor are onomatopoeic expressions marginal and therefore negligible in language, as is sometimes supposed. In Estonian, for instance, twenty percent of the vocabulary belongs to the onomatopoeic phono-semantic substratum (Anderson 1998: 29, 129–166; Crystal 1995: 174; Pinker 2003: 173).

Non-arbitrary features of language also include cases of mimicking meaning through the physical attributes of articulation – what is known as *kinaesthetic iconicity* (Anderson 1998: 167–190). Phonemes pronounced with bilabial rounding, for example, can be regarded as kinaesthetic when they occur in words whose meanings include curvilinearity, as in *round*, *mound*, *mouth*, *oral*, *pool*, *world*, *whirl*, or openness, as in *open*, *door*, or *broach*. Even if the vast majority of words pronounced with bilabial rounding do not have meanings relating to curvilinearity or openness, given the human propensity towards mimetic thinking kinesthesia, like onomatopoeia, always remains an iconic possibility, so that a word whose

articulation somehow “resembles” its meaning will be perceived as more “natural” than the entirely arbitrary one.

Thus for example English *here*, French *ici*, and Urdu *idr* are articulated with the mouth drawn back, as though toward oneself, while *there*, *là*, and *udr* are articulated with the tongue brought forward, pointing as it were to the contiguous original. A survey of 136 languages also demonstrated that proximity as opposed to distance is associated with high front vowels and with high tone. There is a universal pattern of vowel contrasts, in which vowels for words of proximity (as in *here*) are relatively high-front, whereas vowels in words for distance (as in *there*) are lower or further back (Anderson 1998: 94). The kinaesthetic expressions *nam-by-pamby* and *sneer* are pronounced with the mouth and nose wrinkling in an expression of dislike. Collocations of words with consonant clusters *gr-*, *gn-*, *gl-* in English can be interpreted as imitative of grinning, growling, groaning, as can other expressions or paraverbals in which the jaw or throat comes into play. Among the most common forms of kinesthesia is the association of plosives, fricatives and affricates with aspiration and, by metaphorical extension, with the wind or a storm. The storm in *King Lear* is represented in part by Lear’s apostrophe: “Blow, winds, and crack your cheeks! rage! blow!” (3.2.1) and actors playing the part can increase the explosiveness of *bl-*, *cr-*, and *ch-* sounds in order to make its expressiveness correspond to its meaning. *Blow*, *crack*, and *cheeks* are not onomatopes; they do not “sound” anything like the wind or a storm, but their articulation requires a forceful air flow through the oral cavity as a partial iconic representation of a storm (Shakespeare 1997: 263; Anderson 1998: 186).

A particularly rich source of linguistic iconicity is *synaesthesia*, in which certain phonological patterns are intuitively perceived to represent visual or tactile properties of objects, such as size, shape, softness, temperature, movement, weight and so on (Sadowski 2003: 418). Synaesthesia refers to a subjective psychological experience of cross modality, that is, of interpreting one sense in terms of another, as in “seeing” musical notes as colours, or in “hearing” different colours as musical notes. As Leanne Hinton puts it, synaesthetic signs are a result of an “acoustic symbolisation of non-acoustic phenomena” (Hinton, Nichols and Ohala 1994: 4). As I also mentioned earlier, in phono-semantic experiments subjects would describe the liquid phoneme [r] transmodally as “rough,” “strong,” “heavy,” “bitter” etc., and [l] as “tame,” “peaceful,” “smooth,” “light-weight,” “clear,” “weak” and so on (Jakobson and Waugh 1987: 187). In other words, phonetic, acoustic phenomena can be subjectively associated with visual, tactile, and even gustatory sensations. Synaesthesia represents a significant tendency in languages throughout the world: for instance, in almost ninety percent of the languages that have diminutive marking, the diminutive is imitated by the use of high front vowels. Analyses of vocabulary and psycholinguistic experiments also reveal a significant tendency to

associate small size with high front vowels and large size with lower or back vowels. Jonathan Swift's names in *Gulliver's Travels* provide convenient examples: his *Lilliput*, the diminutive land of midgets, and *Brobdingnag*, the land of giants, are influenced in part by vowel contrasts. As Steven Mithen also observes, the association between sound and size may have played a role in the naming of animals. He quotes an experiment conducted by the ethno-biologist Brent Berlin, who examined the names of fish among the Huambisa of Peru and the Malay in Malaysia. (Berlin chose fish to avoid any onomatopoeic influence.) In both languages there was a very significant association between the size of the fish and the types of vowels used in their names. The fish small in size were more likely to have names using the vowel [i], while those that are relatively larger were more likely to use the vowels [e, a, o, u]. There is an intuitive recognition across different cultures that names belonging to certain types of animals rely on unconscious links between the sound of the word and the physical characteristics of the animal. The names used for animals are frequently not entirely arbitrary but reflect inherent properties of the animal concerned, including the sounds they make, their size, and the way they move (for example, high frequency sounds are often used for animals, such as birds, that move quickly and rapidly, and low frequency sounds are used for animals moving slowly) (Mithen 2005: 170).

Intuitive associations between sounds and other physical properties of objects are just as frequent. A study by the psychologists Robert D. Tarte and Michael W. O'Boyle revealed that informants, when asked to match geometric shapes with pure tone frequencies, preferred circles and ellipses with lower frequencies, and angular figures with higher frequencies. Cross-cultural studies including Americans, Navajos, Mexican-Spanish, and Japanese speakers show that people in all these groups regard "happy" as "up" and "sad" as "down," "excitement" as "colourful," and "calm" as "colourless," thus suggesting that despite other cultural differences there is an underlying universality in the affective domain (Anderson 1998: 197). Physical movement and substance can be suggested phonetically as well. The linguist Otto Jespersen noted a cross-cultural connotation of the [l] sound with "light movement," in English found in word-initial clusters such as *fl-*, *sl-*, or *gl-*, as in *flow*, *flake*, *flip*, *flutter*, *flicker*, *flop*, *fling*, *flurry*, *slide*, *slither*, *glide*, or *glance* (Jespersen 1922: 400). An early French philologist Charles de Brosses observed in his treatise on etymology in 1765 that words beginning with [fl-] have a "flowing" or "liquid" quality about them (Anderson 1998: 61). Expressive consonants also have a tendency to group themselves in "colonies" through the agencies of rhyme, alliteration, and consonantal or vowel ablaut (e.g. *flip-flop*). The linguist David Reid notes a statistical tendency of the [l] sound in words denoting "light objects:" a *lance* as a light weapon, a *latch* as a light fastening, *lather* as light foam, a *lilt* as a light song, *lunch* as a light meal and so on (Reid 1967: 24). In brief, the [l]

sound seems to reveal an observable tendency to denote lack of size or substance, and the uncertain, repeated, light and sudden movement (Crystal 1995: 251).

A particularly interesting case of synaesthetic phonetic iconicity is the word-initial *gl-* cluster, which includes the voiced plosive articulated with the back of the tongue at the rear of the mouth cavity, followed by a continuous, sonorant lateral sound produced with the tip of the tongue pressed against the alveolar ridge, that is, towards the front of the mouth cavity. In this way the phonetic properties of the cluster illustrate iconically an abrupt and definite start of a process: a decisive beginning from a single point followed by a smooth, gliding movement away from the starting point and continuing in time. The energetic, explosive quality of [g] is thus combined with the light movement of [l] to suggest, for instance, immaterial light shining away from its source. Indeed, such appears to be the main connotation of the English *gl-* words, as evidenced by *glade*, *glass*, *gleam*, *gleed*, *glimmer*, *glisten*, *glent*, *glitter*, and *glow*. Other English words starting with *gl-* also have to do with light: *glance*, *glare*, *glint*, *gloat*, *glower*, or *glut*, or with darkness: *gloaming*, *gloom*, *glower*, and *glum*. Another series of *gl-* words indicates light movement: *glace*, *glaiive*, *glance*, *glent*, *glide*, *glint*, *glissade*; smoothness: *glaborous*, *gleg*, *glib*, *glossy*; slimy, smooth and shiny substance: *glair*, *gleet*, *glue*; as well as joy and splendour: *glad*, *glee*, *glamour*, and *glory*. An examination of the entire lexicon of English *gl-* words (most of them Anglo-Saxon or Scandinavian in origin) reveals that nearly eighty percent fall into clearly distinguishable and semantically related clusters of meaning related to light, looking, and movement, a percentage high above what one would expect from a purely random and arbitrary distribution of meaning in phonetically related words (Sadowski 2001b: 76).

Nor are the semantic connotations identified for the *gl-* words confined to English, suggesting that phonetic iconicity is neither accidental nor language-specific. The English words are in fact related historically to semantically similar *gl-* words from Old English as well as Old Norse (e.g. *glenten*), Middle Dutch (e.g. *glaren*), Middle Low German (e.g. *glimsen*), all meaning “to shine” and “to look.” Old Icelandic, another Germanic language that may have lent several *gl-* words to Middle English, possesses the following rich lexicon of *gl-* words relating to “light,” “brightness,” and “sight”: *gladr*, *glampi*, *glas*, *glap*, *glit*, *glja*, *gloa*, *glöð*, *glora*, *glygg*, as well as words meaning “illusion,” “vision,” or “image”: *glap*, *glamr*, and *glika*. The *gl-* words referring to “shiny, slimy, half-liquid substance” have their equivalents in Old French (e.g. *glair*, *glet*, *gleu*) and Old Irish (e.g. *gleimen*). One suspects the involvement of phonetic criteria in the borrowing of certain foreign words, whereby the assimilation of new words is facilitated by the phono-semantic intuitions of a speech community. For example in Old Irish, a non-Germanic Indo-European language with a history of interaction both with English and Latin, twenty-seven percent of *gl-* words likewise refer to “light,” “brightness,” and

“clarity.” They include *glain*, *glan*, *glas*, *gle*, *gleid*, *gleoir*, *glesse*, *glethach*, *glicc*, *glor*, and *gluair*. In Slavonic languages the choice of *gl-* words appears to be narrower, possibly due to phonological constraints which are different in different languages (Chinese, for example, has no [gl] sound in its phonological system at all). The light-related vocabulary includes Russian *glazet*’, “to stare,” *glaz*, “eye, eyesight,” *glanet*’, “gloss, lustre,” and the famous *glasnost*’, “openness,” (from “to make visible”). While phonetic iconicity belongs to an expressive dimension available to all languages, the distribution of particular examples of phonetic iconicity appears to depend on the requirements and restrictions of phonological systems that are peculiar to languages (Sadowski 2001b: 82).

The word-initial *gl-* phenomenon is an example of *chromaesthesia*, or *audition colorée*, a sub-type of synaesthetic iconicity in which perception of light or colour is evoked transmodally through sound, as in iconizing brightness and light colours by high or front vowels (e.g. *gleam*, *glitter*, *glimmer*), and darkness or dark colours by lower back vowels (as in *gloom*). The basis for these correspondences seems to be acoustic: in psycholinguistic experiments informants tend to match bright colours with high pitch and dark colours with low or soft pitch. Loud tones were also found to correspond with light grey colours, and soft tones with dark grey (Anderson 1998: 101, 191, 218; Sadowski 2002: 38–40). For Roman Jakobson the entire vowel system displays “almost the same fundamental properties as the chromatic colours” (Jakobson and Waugh 1987: 188–92). Contrary to a prevailing view, transmodal perceptions are not rare or pathological, but are quite common, especially among artists, musicians, painters, or poets, who often talk about “hearing colours” and “feeling their temperature,” as in the sensation of “warm” and “cold” colours, or in hearing “sweet” or “heavy” sounds. Whatever the primary medium of expression, visual in painting or auditory in music or poetry, artistic success often depends on the activation of polymodal experiences through cross-references between different sensory perceptions, and on blurring the boundaries between the senses in an effort to achieve richer poetic evocativeness and expressiveness.

Linguists also distinguish *phonaesthetic* iconicity, in which certain sound patterns suggest emotions, but not in a direct, symptomatic way as was the case with emotive signs. For example, in phonaesthetic iconicity back vowels are perceived as “aggressive,” “bold,” “extroverted,” and “energetic,” whereas front vowels are perceived as “kind,” “just,” and “honest.” Otto Jespersen’s analysis of words with high front vowels [i] and [i:] also revealed their connotations with weakness or triviality as well as with littleness, proximity, and pettiness (Jespersen 1922: 235). In their comparative study of English, French, and Hungarian vocabulary the linguists Ivan and Judit Fónagy have also shown that high front vowels appear more often in words whose semantic fields relate to “light, above, cheerful, pretty, sweet, small, quick,” and less often in words whose semantic fields relate to “dark, below, sad,

ugly, bitter, big, slow.” In like manner in these three languages “hard” consonants /t, k, r/ are more frequent in words relating to “anger, wild, hard, bad, bitter,” and “soft” consonants /l, j, m/ are more frequent in words relating to “love, tender, soft, good, sweet” (Anderson 1998: 224, 226).

Morphological and syntactic iconicity

Word inflections can also be interpreted iconically, as when a morpheme is added (never subtracted) to form a plural (e.g. *dog, dogs*), so that the extension of the word mimics the multiplication of referents. Another often cited example of *morphological iconicity* is that of adjectives in the positive, comparative, and superlative degrees in Indo-European languages: these show a gradual increase in the number of phonemes used, as in *high, higher, highest; altus, altior, altissimus*. Iconicity can also appear in individual words as well as in inflections, as in the case of reduplication (e.g. *ping-pong, tom-tom, zigzag*) which imitates the impression of repetitive action or sound. In languages around the world reduplication, often accompanied by vowel or consonantal ablaut, can be used to create onomatopoeia, synaesthesia, and phonoaesthesia. Synaesthetic reduplication includes *eentsy-weentsy, fuzzy-wuzzy, hurly-burly, teeny-weeny, yo-yo, zigzag*, whereas reduplicative words combining onomatopoeia and synaesthesia include *dingdong, pitter-patter, ping-pong, ticktock*. Phonoaesthetic reduplication in turn includes words suggestive of the comic or of disesteem: *claptrap, hocus-pocus, hugger-mugger, jeepers creepers, lulu, nitty-gritty, okeydokey, razzle-dazzle, riffraff, shilly-shally* and so on (Anderson 1998: 240, 256).

At a still higher linguistic level we can talk about *syntactic iconicity*, in which word order can relate variously to chronology, hierarchy, preference, direction, duration, or complexity versus simplicity. Syntactic iconicity is perhaps more apparent and less subjective than phonetic iconicity, because sentence structure depends on objective spatial-semantic relations which are easier to observe than the more emotive phono-semantic relations. Thus the idiomatic saying *age before beauty* iconizes preference, while expressions such as *pride comes before a fall*, and *the calm before the storm* iconize chronological sequence. There are irreversible binominals that often reflect syntax of preference, in which the positive concept precedes the negative, as in *friend and foe, good and bad, high and low, great and small, heaven and hell, light and dark*. Other forms of semantic preference are apparent in *man and woman, man and wife, mother and child, heaven and earth, sun and moon, north and south, east and west, food and drink, bread and wine, ladies and gentlemen* (Anderson 1998: 267).

Julius Caesar's famous *Veni, vidi, vici* ("I came, I saw, I conquered") is often cited as an example of chronological iconicity, in which the temporal order of speech events mirrors the order of narrated events in time. But as the linguists Olga Fischer and Max Nänny demonstrate, Caesar's compact phrase brings together a number of additional syntactic, morphological, and phonetic iconic features, including the asyndetic syntax (lack of syntactic links) which mirrors the swiftness of Caesar's actions, and the repetition of first-person-singular verbs to convey an emphatic subjective verve and a sense of personal triumph of the speaker. Moreover, the increasing assonance of the three verbs (/i:/ occurs once in *veni* but twice in *vidi* and *vici*) may reflect the growing momentum of Caesar's military operations; a gradual loss of sonority on the consonantal level (from /n/ to /d/ to /k/) may suggest hastened progression with a final punch in victory; while the prosodic repetition of three disyllabic words, each containing a consonant and a long vowel, and each alliterating on /v/, may create a rhythmic effect of three spondees which lend the short words weight and impact. Also, the alliteration on /v/ can highlight the initial sound of the phrasal climax *vici* (a kind of Churchillian V-sign *avant la lettre* so to speak), and a combination of an identical initial consonant with an identical final vowel can be interpreted as adding splendour to Caesar's laconic victory message (Fischer and Nänny 2001: 2).

Some forms of syntactic iconicity are universal or at least reveal round-the-world tendencies. For instance, subject, verb, and object (SVO) are the basic syntactic elements found in all languages, because they reflect the fundamental types of functional relationships between adaptively significant elements (agents or recipients of action): who (what) is doing what to whom (what). The linguist R. S. Tomlin has conducted a syntactic analysis of 402 languages of the world, and has shown that forty-five percent have SOV word order, forty-two percent have SVO word order, nine percent have VSO word order, three percent have VOS word order, one percent has OVS, and none has OSV. Languages may differ (but not randomly) in the orders of subject, object and verb, but all languages use these syntactic components, which means that they have structures that perform the function of nouns, verbs, adjectives and prepositions. Tomlin's analysis also demonstrates that in eighty-seven percent of world languages subject (agent of action) is more important than verb (action) and object (recipient of action), and that in no language object ever comes first (Tomlin 1986).

The regularities in basic word order are just one illustration of the natural, extra-linguistic motivation in language that qualifies and constrains the arbitrariness of linguistic structures. For example, languages tend to group together syntactically what perceptively belongs together (e.g. *a red car*, if the perceived car is red). Grammatical agreement syntactically connects words denoting propositions that "go together" mentally (e.g. *he works*, in which "he" and "works" are linked

together by perceived or imagined relationship). All languages must be capable of expressing certain ideas: perceptual experiences, social relationships, biological and physical facts. At the same time all spoken languages must conform to human cognitive, physiological and anatomical limitations, to our limited memory and to the way our ears and mouths are constructed.

As the linguists Eve V. Clark and Herbert H. Clark also demonstrate, people in all cultures divide the inanimate world, the plant and animal kingdoms, and the social world into categories, each of which is given a name. The natural categories into which people slice up the world are products of the universal human perceptual and cognitive apparatus devised by evolution for dealing with the world. Objects are perceived in terms of attributes which in nature come in clusters. For example, if an object is feathered, it is a good bet that it sings, flies, has a beak, and a particular shape. It is also a good bet that it doesn't roar, bear live young, or have four legs. Attributes that go together, like feathered, singing, flying, beaked, and bird-shaped, define a natural category called "bird," and the objects within a single category share attributes with each other (Clark and Clark 1978: 236). Other language universals examined by Clark and Clark include such cognitive categories as number, negativity, cause and effect, and time. Thus most languages have ways of expressing singular and plural in nouns, and singular, as perceptively more salient, is always unmarked grammatically, whereas plural is always marked, as in *cat*, *cats*. Negatives are always marked with respect to positives, as positive statements are primary and more easily processed than negatives: it takes more specification to say what something is *not* than to say what something is. If a language has expressions that differ in complexity for *state*, *change of state*, and *cause of change of state*, as in *dead*, *die*, and *kill*, then they are given increasingly complex expression. Finally, all languages have ways of distinguishing among the present, past, and future, but the past is usually marked with respect to the present, and the future always is: for example, *work*, *worked*, *will work* (Clark and Clark 1978: 247–251).

All languages also appear to make reference to such spatial dimensions as height, width, distance, and thickness, because these are the dimensions that the human perceptual apparatus is tuned to pick out. One of the adaptively important dimensions is defined by the vertical pull of gravity, and there is also a natural plane of reference in the form of ground level. Verticality and horizontality are therefore two perceptual invariants, two co-ordinates organizing spatial relations, as reflected in such wide-spread verbal adjectives as *high*, *low*, *tall*, *short*; prepositions like *up*, *down*, *above*, *below*; and verbs like *rise*, *fall*, *raise*, *lower*, *lift*, and *drop*. Human body too has a biologically defined and perceptually obvious plane of symmetry – the sagittal plane that splits the left and right sides of the body in half, which defines the dimension underlying *left* and *right*. The line running from head to toe in the sagittal plane defines another perceptually salient dimension, body

verticality, and perpendicular to that plane is *front* and *back*. The linguistic terms used with these two dimensions have therefore natural, non-arbitrary origins. English, like many other languages, builds many of its relational terms for the up-down, front-back, and left-right dimensions around appropriate body parts, such as head, front, face, back, top, foot, and side, as in *ahead*, *in front*, *facing*, *at the back*, *on top*, *at the foot*, and *beside*. These terms are also transferred to the vertical, front-back, and lateral dimensions of other objects that have a normal spatial orientation: cars, trains, houses, mountains, trees and so on. When people stand, the space in front of them and above the ground is adaptively optimal for perception by eye, ear, and touch. Hence “upward” and “forward” should be “positive” directions, including the metaphorical uses such as *high* versus *low opinion*, or *forward* versus *backward policies*. The left and right sides of the body are symmetrical about the sagittal plane (unlike *high* versus *low*), but since most people are right-handed, *right* should be “positive,” as it indeed is in perhaps all languages. For example, *dexterous* comes from the Latin word for “right,” and *sinister* from the word for “left.” In English *right*, both as a noun and as an adjective, means “lawful,” “correct,” “proper,” “truthful” *etc.*

Linguistic social categories also have their roots in certain universal social and cultural conditions in which people live. All languages distinguish at least three characteristics in relatives: generation, blood relationship, and sex. In addition, all languages distinguish between blood relatives and spouse’s relatives, as the English *mother* versus *mother-in-law*. All languages treat relatives unequally: they favour ancestors over descendants, near relatives over far relatives, and blood relatives over spouse’s relatives. Another widespread though not universal bias in language is the one favouring male over female: in English, for example, the markedness of female is especially visible, as in *actor-actress*, *major-majorette* (Clark and Clark 1978: 242, 251–254).

Iconic gestures

The universal presence of diverse types of iconic features in languages must therefore qualify the structuralist claim about the fundamental arbitrariness of the linguistic sign. That is to say, arbitrariness and iconicity are not mutually exclusive but co-existing linguistic features that together reinforce the communicative and expressive power of language. The fact that arbitrariness dominates in human verbal language does not automatically obliterate the presence and influence of evolutionary older, emotive and iconic elements of speech. The iconic dimension is even more visible (literally) in sign languages – supposedly conventional, invented systems of gestural communication used as a substitute for “natural” speech.

Despite their conventionality, however, sign languages reveal a substantial (much higher in fact than in spoken languages) admixture of iconic features to complement the arbitrariness of the visual sign system.

Just as the arbitrary signs of speech build upon (without cancelling) the evolutionary older emotive and iconic auditory features, so the artificial sign languages construct their own gestural arbitrary signs on the basis of the more archaic visual communication and body language, found in abundance in the animal kingdom. As I noted earlier, human visual communication works as part of the innate cognitive modules subsumed under the social need, and it involves first of all facial expressions, manual gestures, and bodily postures. Manual gestures provide a more natural medium for intentional interactions among primates, and typically occur in the wild in contexts with a clear social component, such as play, aggression, appeasement, eating, sex, and grooming (Corballis 2002: 167). In humans visual communication occupies as much as sixty-five percent of contiguous interpersonal relations, conveying primarily emotions (facial expressions) as well as referring to external objects and states, as in gestures, which tend to be iconic, providing by manual action an image of something a person is talking about, including gestural imitations of actions and behaviours, of movements, shapes, and spatial relations. Some movements of body parts (the head, eyes, brows, mouth, hands) commonly occur when people speak. Such movements are patterned in relation to speech and can contribute to the utterance in various ways: they can play a role in indicating to whom the utterance is addressed, they add to the emotional aspect of the utterance, they serve as markers of utterance structure, and they can mimic aspects of the content of the utterances (Kendon 1993: 43).

Many gestures also occur universally, regardless of cultural differences. These include the shoulder shrug with upturned palms and a raised brow as a sign of lack of knowledge or understanding; arms folded across the chest as a defensive gesture; hand-to-mouth gesture when telling a lie or covering embarrassment; rubbing the hands together to indicate a positive expectation; and differing types of handshakes and kisses to indicate different attitudes towards the person being greeted (Mithen 2005: 89). In contiguous interactions humans are not much different in this respect from other primates, whose communication is likewise multi-modal, involving a synchronized use of vocalizations and gestures. For example, more than thirty different types of gestures were recorded among the gorillas, some of them tactile and iconic, as in touching the body of another gorilla and moving the hand in the direction in which it is to move: here the path of the gesture imitates the desired path of the body movement (Mithen 2005: 118; Kendon 1993: 51–53).

As Steven Mithen also points out, the gestural communication of early humans was greatly enhanced by the new degrees of motor control made possible by

bipedalism, fully achieved by *Homo ergaster* (about two million years ago). The permanent upright body posture was probably an adaptation to reduce heat stress caused by increased exposure to the sun in the treeless, savannah-like landscapes of East Africa where our species evolved. The resulting independence of torso and arms from legs would have dramatically enhanced the potential for gesture and body language, as well as for the use of the freed hands in such activities as carrying, throwing or making tools. This would have added to vocalization a powerful means of expressing and inducing emotions and manipulating behaviour. Mithen speculates that the proto-language of *Homo ergaster* probably consisted of holistic utterances, each with its own meaning but lacking any meaningful sub-units (no syntax), which were employed to manipulate other individuals through commands, threats, greetings and requests in contiguous interactions. These holistic vocalizations would have been expressed in conjunction with hand and arm gestures and perhaps body language as a whole. Gestures would be largely iconic, just as they are now in humans. They would be particularly important for conveying information about the speed and direction of movement, about the relative position of people and objects, and about the relative size of people and objects. In addition, such musical features as particular levels of pitch, tempo, loudness, repetition and rhythm would have been used to create particular emotional effects in the utterances. Given the complex social life of hominids, those who were most effective at gesture and body language would have been at a social and reproductive advantage (Mithen 2005: 144–157).

Today's sign languages, both those spontaneously developed by deaf communities and those codified by convention, must therefore avail of the innate cognitive and motor abilities for gestural iconic communication developed by humans during their evolution as primates. The visual character of sign languages also explains why they show a much greater tendency towards iconicity than does the auditory system of speech. As the linguists Klaudia Grote and Erika Linz point out, due to the predominance of visual over auditory perception in human interactions with external objects, there are many more possibilities to depict visual similarities than there are to produce acoustic ones in the process of sign-creation. That is to say, it is easier to create a visual correspondence between an external referent and the properties of visual-gestural signs than to create an acoustic correspondence between a referent and vocal signs (Grote and Linz 2003: 23). The psychologist Michael C. Corballis puts it simply: "speech is more arbitrary than iconic; gestures are more iconic than arbitrary" (Corballis 2002: 161). As a result, all sign languages possess many more signs of highly imitative, iconic quality in comparison to the relatively smaller number of iconic features found in spoken languages. For instance, in the sign language of the Australian Warlpiri the sign for "crazy," in which a flat hand is moved forward and back beside the ear, can be

understood a gestural imitation of a blocked ear. In aboriginal Australian culture the ear is the channel of understanding, and persons who behave stupidly or crazily are said to have blocked ears (Kendon 1993: 55). The visual character of sign languages also means that where spoken languages order their elements sequentially, in a linear fashion, sign languages use a multidimensional space to simultaneously articulate the different elements. The grammar of sign languages thus makes explicit use of space to provide structure for its elements. For example, grammatical tense is rendered spatially (and iconically) in terms of a time-line that locates the past behind the signer, the present close to the signer's body, and the future in front (Hauser 1998: 239; Corballis 2002: 163). American Sign Language consists of about twenty-five percent of signs that are either pantomimic (mimicking a complete action) or imitative (partially mimicking an action). Of the remaining seventy-five percent, two-thirds are derived from pantomimic or imitative gestures, and only one-third are completely arbitrary symbols (Anderson 1998: 23). Indeed, for a long time it was widely believed that sign languages were a kind of pantomime, purely iconic, with no formal linguistic structure.

Like articulated speech, sign languages are fully autonomous languages, with all the properties common to all natural languages – they are rule-governed, grammatical symbol systems that change over time and that members of a sign language community share. But sign languages are also distinct from spoken languages in both grammar and lexicon. The “phonological” units to construct signs involve manual parameters such as hand-shapes, hand-orientations, hand-movements, and hand-locations, as well as non-manual signals such as facial expressions (brow raises, eye blinks, mouth gesture and mouth picture), head nods, head tilts, shifts of the body and shoulders (Grote and Linz 2003: 37). All these parameters do not just represent their referents iconically, on a one-to-one basis, but have grammatical, combinatorial functions, just like phonemes, morphemes, and words in spoken languages. For instance, the signs for “tree” in American, Danish, and Chinese sign languages carry something of the shape of a tree (with some inter-linguistic variations), but like the word for “tree” in spoken languages these signs can also be combined in utterances according to the syntactic, arbitrary rules peculiar to language (Corballis 2002: 163).

As is also the case with spoken languages, when sign languages evolve the direction of change in particular signs and in their visual grammar is from iconic and representational to more arbitrary and constrained (Klima and Bellugi 1979: 28). Studies of deaf children inventing their own home sign suggest that signs are initially coined for their resemblances to what they represent, but are later adapted to a more arbitrary form: iconic resemblance may be necessary to get signs up and running, but it loses its importance once signs are established (Corballis 2002: 163). As the linguist Adam Kendon explains, iconic gestures

referring to objects and actions first undergo simplification into signs representing concepts, and then the formally reduced signs are retained only if they remain in *contrast* to features of other gestures within the sign system. During the formal reduction of the gesture an element from an elaborate pantomime gets selected for repeated use and comes to stand for the whole concept (in the name of economy), and then the element becomes simplified to such a degree that its iconic character is no longer apparent. In this way the sign turns into an arbitrary form, shaped only by the requirement to be distinct from other signs within the system. After losing its iconic character the sign becomes available for syntactic recombination with other signs to form compound signs or sentences (Kendon 1993: 58).

While at the iconic stage quantitative changes in the sign do not change its meaning but only add (or subtract) emphasis, at the arbitrary stage even slight variations (contrasts) in performance may produce completely different meanings. For example, in Warlpiri sign language to bring a flat hand into contact with the centre of the upper chest is to sign “water,” but when the hand is moved laterally the meaning is “man.” Sign languages thus operate as combinations of a limited number of contrastive features. Just as in spoken languages, where words and morphemes are analysable as combinations of contrastive sounds (phonemes), so in sign languages signs contrast in terms of hand-shapes, location of performance in relation to the body, and patterns of movement. Codified gestures are, like words, capable of entering into combinations with one another, thus creating new codified gestures. For instance, in American Sign Language to sign “home” you move a “tapered” hand first to touch the mouth, then to touch the cheek. This is derived from a combination of two signs: the sign for “eat,” in which you touch the mouth with a “tapered” hand, and the sign for “sleep,” in which you place the palm of the hand against the side of the face (Kendon 1993: 51–53). Michael C. Corballis even suggests that linguistic grammar might have evolved from representational and indicative gestures rather than from animal calls and early human vocal signals. Implicit in any simple gesture is the subject-verb-object relation that represents the structure of a basic sentence, as well as the structure of simple events in the real world. Indeed, the mimetic gestures and body language used by the apes such as chimpanzees, bonobo, and gorillas are much more complex than their emotive and mimetic vocalizations. The human syntactic language may thus have evolved, argues Corballis, primarily in the context of gesture, accompanied by a late-emerging vocal system. This means that language is not necessarily confined to the vocal auditory channel, but can function just as well in the visual-gestural modality (Corballis 2002: 164, 173; Ingold 1993: 37).

Both in visual sign languages and in auditory verbal languages arbitrariness thus typifies more advanced, post-iconic stages in the evolution of the communication system. Whatever the benefits of arbitrary systems of communication over

iconic ones, it seems clear in the light of the evidence adduced in this chapter that contemporary languages continue to possess kinesthetic, onomatopoeic, synaesthetic and other iconic attributes carried over from ancient times. Linguistic iconicity appears to be a universal phenomenon whereby speakers perceive intuitive, “natural” connections between the form of the linguistic sign and its meaning. In the simplest definition verbal iconicity denotes a degree of natural correspondence between phonology and semantics, an inmost, intuitively felt, “natural” similarity association between sound and sense (Jespersen 1922: 396–411; Sapir 1929: 225–227; Jakobson and Waugh 1987: 178). In this sense linguistic iconicity is a kind of “popular etymology” based on “expressive” or “impressive” phonetics and other features of language, instinctively recognized as valid by popular agreement within a speech community, especially by its more language-sensitive members such as children or poets. As is now recognized by many linguists, linguistic iconicity extends far beyond the small class of onomatopoeic words, and constitutes a separate linguistic dimension, in many aspects alienated from conventionally structured speech, and including such phenomena as child language, interjections, language play and the like, characterized as expressive, affective, connotative – generally indexical and iconic (Hinton, Nichols and Ohala 1994: 1–12; Anderson 1998: 15–44; Fischer and Nänny 2001). This is obviously not to say that all elements of language carry naturally motivated signification, although a sizeable category certainly does, even if particular elements are iconic only in some words or structures and not in others. Iconicity may be peripheral in more formal, discursive, and especially written language, but it moves centre stage in informal speech, becoming a dominant dimension in the poetic use of language, where onomatopes, synaesthesia, rhyme, assonance, alliteration and other iconic features all contribute to the characteristically emotive, evocative, and suggestive quality of poetic language.

The universality of emotive and iconic sounds, now demonstrated in psycholinguistic experiments, speaks in favour of an iconic *Ursprache*, a kind of archetypal phonology consisting of natural sound-object associations, deposited in the deep layers of phylogenetic memory as part of human evolutionary legacy (Priestly 1994: 237). Articulated speech as an advantageous tool in social communication must have arisen from intricate instrumental relations between early humans and the natural environment, where the sound shape of language initially reflected those complex relations in a natural and direct way, including the power of speech to imitate the multivalent sensory inputs. Iconicity as an analogy between the phonetic properties of speech sounds and the physical, including acoustic, properties of different objects and phenomena can be seen as a logical consequence of evolution, in that quick identification of the relevant elements of the environment would have a clear adaptive advantage. The benefits of spontaneous

sound-iconic communication have been demonstrated by experiments in which reaction-times of making correct judgments about the meanings of words were proven to be much shorter for iconic words than for purely arbitrary ones. In the human and non-human world alike, speed and accuracy of communication are usually to the benefit of both the speaker and the hearer, and are greatly enhanced if the form of vocalization is tied directly to meaning in a non-arbitrary way. In fact, as the linguist Leanne Hinton remarks, it is the evolutionary value of arbitrariness that requires an explanation (Hinton, Nichols and Ohala 1994: 11).

The origins of language and the advantages of arbitrariness

From the evolutionary point of view syntactic speech using arbitrary signs appears therefore to be built upon phylogenetically older perceptual and cognitive mechanisms underlying indexical and iconic vocalizations, still found in today's languages on the level of sounds, words, and sentences. All systems of indirect communication, whether auditory or visual, rely on the associative distance between the perception of the sign and its cognitive interpretation, and in all non-arbitrary forms of communication that associative distance always retains some degree of identifiable connection between image and original: causal, or symptomatic in indexes, and analogous in icons. But there evidently came a "moment" in the evolution of human communication, when the image-original, or sign-referent association bypassed the perceptual automatisms governed by the archaic neural structures inherited by humans from the primates, to form a new type of association, governed by the evolutionary more recent cerebral cortex that allowed for a more flexible, volitional, and conventional connection between sign and its meaning, one neither motivated emotively nor based on physical resemblance or contiguity.

The appearance of arbitrary symbolic signs, most probably first in spoken language rather than in visual communication, alongside the older emotive and iconic vocal features, must have coincided with the arrival on the scene of the *Homo sapiens* around 170,000 years ago, with their diffusion from East Africa to the rest of the globe, and with the subsequent "explosive" genesis of visual culture between 60,000 and 30,000 years ago (Aitchison 2000: 161; Watts 1999: 113). The emergence of fully modern syntactic language was most probably correlated with the appearance of representational and decorative art, the introduction of burial rituals and the accelerated diversification of technology at the Middle-Upper Palaeolithic transition (Carruthers and Chamberlain 2000: 6). Once the early nomadic hunting-gathering communities began to separate and disperse geographically, their languages also differentiated, eventually giving rise to the present variety of ethnic languages and dialects of the world. The diversification of lexicons, grammars, and phonological systems must have been aided by and in itself encouraged the gradual loss of linguistic iconicity in favour of arbitrariness, leading to the

situation in which there may theoretically be as many different names for the same referent as there are languages.

As argued by Steven Pinker and Paul Bloom, the preference for arbitrariness turned out to be a more effective option from an evolutionary point of view, in that it resolved a difficulty of developing a huge innate code for numerous sound-meaning iconic correspondences. Instead, it was neurophysiologically easier to evolve a mental device for learning arbitrary sound-meaning pairs peculiar to one's speech community, a process that also enhanced group cohesion by increasing cultural diversity along linguistic lines (Pinker and Bloom 1992: 465–470; Knight 1999: 243; Nettle 1999: 214, 219–224). The considerable liberation of language from the constraints of emotive and iconic vocalizations not only triggered the multiplication and diversification of ethnic languages, but it also enabled each language to develop towards greater structural complexity of sophisticated discrete, combinatorial systems, capable of practically unlimited creativity in reflecting the ever-complicating socio-cultural realities. These remarkable transformations in human vocal communication would not be possible without the dominance of arbitrary linguistic signs, but it is unlikely that emotiveness and iconicity as the more archaic features of language have disappeared in the process or are ever likely to disappear; they are too much a part of human neurophysiology. As long as emotions, instincts, intuitions, and thinking through analogies exist, language will retain its expressive and emotive function in child talk, poetry, drama, religious mantras, colloquial word-plays and verbal advertising.

Discrete syntax for the (partly) discrete world

The effectiveness of any communication system can be measured by the speed and variability of signal emission (in consequence by the amount of information that can be conveyed within a unit of time), as well as by the physical distance between sender and receiver in natural conditions. The tactile channel for example does not permit any physical distance between sender and receiver, and is typically limited to no more than two communicators at any given time (as in grooming or love-making). The olfactory channel on the other hand can carry (albeit relatively slowly) signals between several spatially separated communicators, but the emission of smells (especially natural odours) remains largely outside the sender's control, and their number and variability are for physiological reasons also very limited. Sight is in many respects a powerful sense in humans, in that it can pick up signals in good visibility from kilometres away, although in inter-personal communication the distance is limited by how close the communicators have to remain to read each other's body posture, gestures, and facial expressions. The rate of signal

change is also comparatively high in visual communication: up to about sixteen discrete signals per second (which is why to create an illusion of smooth movement the movie camera has to record a succession of separate frames at least at that speed). In practice however, the speed of visual, gestural communication is limited more by the motor constraints of body language. Visual inter-personal communication also requires, by definition, sufficient visibility (in practice limited to daylight hours), eye contact, and freed hands. All practicalities of communication considered, the most efficient system of communication available to humans is based not on sight but on audition, and for very good reasons.

A rapid talker can convey as many as forty to forty-five phonemes per second, and even a more leisurely talker can reach between ten and twenty phonemes per second (a signal variation higher than that possible in visual communication). Twenty cycles per second is the lower limit of pitch perception in humans. Anything more frequent than twenty beats per second is perceived as a low tone or a buzz (Lieberman 1977: 17). However, speech can pack as many as forty-five discernible phonemes in a second (acoustically not as discrete but as overlapping sounds), and the brain somehow manages to unpack these meaning-conveying sounds. At the morphemic level, the meaning of a spoken word is accessed by a listener's brain in about a fifth of a second, before the speaker has finished pronouncing it. People produce words almost as rapidly: it takes the brain about a quarter of a second to find a word to name an object, and about another quarter of a second to programme the mouth and tongue to pronounce it (Pinker 2001: 3). By comparison, sign languages are not as quick, in addition to being disadvantaged by the requirements of visibility and face-to-face orientation. Speech is thus by far the fastest way of exchanging information among humans, although it requires a highly sophisticated vocal apparatus, one capable of producing rapid sequences of precisely modulated sounds and their quick recombination (Pinker 1995: 168; 1997: 167; Hauser 1998: 244; Johansson 2006: 77). Other advantages of the auditory channel include its broadcast transmission and directional reception, which means that signals can be detected by any receiver within hearing range, largely independently from physical obstacles, and that the receiver can localize the signal (Hauser 1998: 48). In other words, in vocal communication information can be conveyed instantaneously from a single source to many receivers. Unlike visual communication speech also works independently from lighting conditions, so it can be used round the clock, not just during daylight hours. Neither does speech require face-to-face orientation or the use of the hands, which means that people can communicate effectively while engaged in other activities requiring visual attention, such as scanning the terrain, tracking animals, making tools, fighting and so on.

High frequency of signal variation is exactly what a combinatorial (digital) code requires, but before speech became combinatorial it started off (and in many respects still continues) as a holistic (analogue) code conveying symptomatic, emotive states (e.g. fear of danger, aggression, pleasure, mating disposition *etc.*) relating to current existential situations (Marler 1977: 54; Sinnema 1986). As I emphasized earlier, symbolic language did not obliterate but built on and incorporated the vocal calls controlled by phylogenetically more archaic neural structures in the brain (not the cerebral cortex) and limbic system, which also regulate such emotive and involuntary vocalizations in humans as sobbing, laughing, moaning, crying with fear or shouting in pain (Pinker 1995: 365; Allen and Sidel 1998: 185; Brown 1991: 131). Like the primate grunts, barks, screams, hoots and roars, human affective sounds vary in loudness, pitch, and frequency, the parameters that iconically reflect the intensity of the states that elicit them. The communicative function of these sounds, however, depends on their holistic character: affective vocalizations differ from one another as *gestalts*, and are not composed of recombinable components that are meaningless in themselves, like the phonemes making up words (Dingwall 1979: 28; Bickerton 1990: 16). The English word *pat*, for example, consists of three phonemes, /p/, /æ/, and /t/, which can be recombined to form semantically different words *tap* and *apt*.

In human language syntax, that is, the process of stringing together independent linguistic subunits into a longer signal, thus appears already on the level of individual sounds. In this “phonological syntax” the units, like the letters in a written word, have generally no independent meaning (except for the potential emotive and iconic value of some phonemes in some contexts, as discussed in Chapter 9). According to the linguist James R. Hurford, many bird species can learn songs using something like phonological syntax. Our closest relatives, the apes, can also produce long calls composed of sub-units. For instance, the long calls of gibbons are used as markers of individual identity or in defence of territory. On the other hand the sub-unit notes, used in isolation, out of the context of long calls, are used in situations of territorial aggression (Hurford 2003: 43; Savage-Rumbaugh *et al.* 1998). According to Marc D. Hauser there is also some evidence that the capuchin monkey, the cotton-top tamarin, and the gibbon employ rudimentary phonological syntax, by being able to transpose or recombine different sounds to code different messages (Hauser 1998: 12).

Although it is perhaps fair to call such abilities in apes pre-syntactic, they are still far removed from the human ability to organize sequences of words into complex hierarchically structured sentences. By and large animal calls and signals cannot be broken down into component parts, and separate sounds cannot be combined as freely as the phonemes, morphemes, and words of human speech to provide additional or different information. Primate calls are still “complete

messages” rather than individual units of communication; they are holistic, with no internal structure, and they are expressive and manipulative rather than referential (Bickerton 1990: 16; 2003: 56). That is to say, they are used in the context of contiguous needs and emergences, rather than in relation to things or situations spatio-temporally displaced from the current communicative context. For instance, the different alarm calls used by the vervet monkeys may “refer” to specific predators such as leopards, eagles, and snakes, but more likely they are simply instinctive emotive reactions to contiguous dangers posed by these predators. Vervets do not use their calls to talk dispassionately about the past or the future, or to describe the world at large, but only to warn one another about specific current danger (Mithen 2005: 108). In the absence of consciousness, working memory, and syntactic language vervet monkeys also do not comment on or analyse the predator threat after the event, nor do they discuss possible improvements in the warning system and defence strategies for the future. Even trained apes can only communicate information that expresses their current wants or emotional states, but never anything distant in time or space. The “here-and-nowness” of animal calls thus differs qualitatively from the unlimited spatio-temporal reference found in human syntactic language (Bickerton 1996: 54; 2003: 87; Gibson 1993b: 6; Laszlo 1972a: 71; Hauser 1998: 39; Eccles 1989: 80).

The early stages in the history of language are also reflected in human ontogeny. Studies on human infants indicate that before they begin to communicate about objects and events in the external environment, infants convey information first of all about their affective state. At the stage of pre-symbolic intentional communication (9 to 15 months) infants address messages to other communicators by sounds and meaningful gestures tied to specific current wants. Between 15 and 24 months vocalizations become less tied to contexts but more to objects. A “naming explosion” takes place, during which relations between sounds and objects are established as the foundation of referential communication. The age of about two also marks the onset of grammar, as the child’s innate language faculty meshes with the parent language’s grammatical structures to generate inflectional morphemes marking past tense, plural number, plus such syntactic operations as relativization, co-ordination, pronominalization, ellipsis, and recursion. From the age of about five onwards a post-syntactic development begins, when the child acquires meta-linguistic skills of word playing, thus completing the ontogenetic development of language from emotive and contiguous vocalizations to fully referential and symbolic syntactic speech (Lock 1993: 279–286).

Given the gradual, cumulative nature of the evolutionary process it seems unlikely that the transition from holistic, analogue vocalizations to combinatorial, digital speech occurred overnight, by means of a single mutation that radically changed the nature of the human language from one generation to the next. Derek

Bickerton argues in favour of a hypothetical intermediate “protolanguage,” for which he finds evidence in the utterances of small children (before two years of age), in ape language, and in early-stage pidgins. All these data show a total absence of complex sentences, a lack of correlation between function and word order, frequent omission of sub-categorical constituents, and all-but-complete absence of grammatical items. Such proto-syntax typically consists of a simple action-subject or action-object combination in response to a contiguous situation: for instance, “me no sleep,” “me look,” “me speak” (Pidgin English); “read story,” “go open door,” “more juice,” “see daddy” (child language); “that eat,” “more pour,” “me good,” “hot potato” (trained apes) (Bickerton 1990: 128). It is probable that the Neanderthals, who co-existed with the *Homo sapiens* until the rapid extinction of the former some 30,000 years ago, also communicated using some rudimentary syntactic structures tied to contiguous situations (Donald 1991: 203–205).

What distinguishes language from protolanguage is syntax, which marked a change from a random stringing together of words into hierarchical tree structures. According to Bickerton, the linguistic history of the hominid line appears as a two-stage process: first there was lexicon without syntax, sound labels to sort raw experience, followed by the emergence of infinitely productive mechanisms to create syntax as we know it. There are no antecedents of syntax in the language of ancestral species: combinatorial grammar could only have come into existence until there was a sizable vocabulary whose units could be organized into complex structures (Bickerton 1990: 91; 1996: 51; Hauser 1998: 40). In addition to content-words (nouns, verbs, adjectives), the range of complex substructures brought into being by hierarchization and the computational procedures also produced abstract markers and non-referential grammatical items such as case-, person-, number-, tense-, mood-, and gender-endings, articles, conjunctions, prepositions, and adverbs – morphemes and words wholly unknown in protolanguage but present in all known human languages. For Bickerton the appearance of protolanguage was unprecedented in the history of evolution – something that made possible what may have been the most far-reaching event since the beginning of life: the emergence of human consciousness and symbolic culture. The “Great Leap Forward,” the relatively sudden explosion of human culture that took place some 40,000 years ago is best explained, argues Bickerton, by the advent of fully syntactic language at about the same time (Bickerton 1996: 57, 66; 2003: 91).

The main advantage of syntactic speech is its capacity to use the combinatorial grammar to rearrange the discrete linguistic elements in order to generate a vast number of statements on subjects extending beyond the necessarily limited contiguous situation. As also stressed by Steven Pinker, the cognitive and communicative benefits of a combinatorial language derive from the fact that the environment which language helps to negotiate has itself partly combinatorial structure.

The world in which we live contains any of a number of actors (people and animals) engaged in any of a number of actions (walking, running, sleeping, eating, fighting, mating *etc.*), taking place in any number of locations and times. In such a world, the number of words that have to be learned by a syntactic communicator equals the sum of the number of actors, actions, places, times, and so on, whereas the number that would have to be learned by a non-syntactic communicator equals their *product*, a potentially unlearnable number. As a more efficient and more accurate system of communication, syntactic speech is thus invaluable, argues Pinker, to an analytical mind in a combinatorial world (Pinker 1995: 365; 2003: 32; 2007: 436; Dunbar 2003: 226; Lieberman 2006).

Noam Chomsky also talks about “discrete infinity” as the property by which language constructs from a few dozen separate elements an infinite variety of expressions of thought, imagination, and feeling. For Chomsky this property of language appears to be “biologically isolated,” because it is unique among systems of animal communication (Chomsky 1957; 1972; 2000: 3). But as the psychologists Michael Studdert-Kennedy and Louise Goldstein point out, the combinatorial nature of the human language is not unique at all, but rather is an instance of a general principle common to all natural systems that, according to Wilhelm von Humboldt, who was the first to formulate the idea in 1836, “make infinite use of finite means” (Studdert-Kennedy and Goldstein 2003: 235). Discrete infinity is based on what Studdert-Kennedy and Goldstein call “the particulate principle,” which provides the only route to unbounded diversity of form and function through a combinatorial hierarchy in which discrete elements, drawn from a finite set, are repeatedly permuted and combined to yield larger units higher in the hierarchy and more diverse in structure and function than their constituents. The particulate units in physical chemistry include atoms, ions, and molecules; in biological inheritance – chemical radicals, genes and proteins; and in language – gestures, syllables, words, and phrases. In this way language, physics, and genetics can be seen as converging in some respects on a common structural principle (Studdert-Kennedy and Goldstein 2003: 236).

Nor is syntactic, combinatorial language possible without the uniquely human extended working memory, involving the ability to hold in conscious attention both the events that are past and those still likely to happen. One of the reasons for the experimenters’ failure to teach syntactic language to the apes is precisely the absence of the concept of the passage of time in all but the human species (Plotkin 1994: 200). At the same time it is probably futile to speculate which came first in human evolutionary history: grammatical language or extended working memory. Speech as a basically temporal medium no doubt contributed to the development of conscious memory, as successivity is the essential feature of auditory coding, in which data is presented in rapid serial order (Sebeok 1967: 367). As also argued by

Gerald M. Edelman and Giulio Tononi, human higher-order consciousness is impossible without the cognitive ability to transcend the limitations of the here-and-now and to embrace the extended perception of time, incorporating past, present, and future. These concepts emerged only when the new semantic capabilities afforded by syntactic language – to refer to displaced objects and events – appeared in the course of evolution. Syntactic speech must therefore have resulted from and in turn must have reinforced linguistic and conceptual memory, while higher-order consciousness could foster the development of concepts of the past and future related to the self and to others. As this point, an individual could be freed, to some extent, from the bondage of the experienced present to embrace a whole new world of intentionality, categorization, and discrimination based on the concepts of time past and time future (Edelman and Tononi 2000: 195). The two cognitive faculties: the extended perception of time and syntactic language must therefore have developed gradually alongside one another related through positive feedback, with grammar acquiring more and more combinatorial features both to reflect and in turn to encourage the ever-expanding conscious perception of the causes and effects in the temporal, processual dimension of life.

Selective pressures on early language

The predominantly symbolic and arbitrary character of syntactic language has traditionally been cited as the prime argument in favour of the exclusively cultural and social, as opposed to the instinctive and natural, origin of this specifically human system of communication. However, just as “nothing in biology makes sense except in the light of evolution” according to the biologist Theodosius Dobzhansky, so nothing really makes sense in culture except when seen from the same evolutionary perspective (Dobzhansky 1962: 215; Dawkins 2003: 68; Badcock 2000: 244). Far from being a cultural artefact that we learn the way we learn traffic rules or how to play the guitar, for Steven Pinker language is a distinct piece of the biological makeup of our brain that has arisen, like all other organs and cognitive faculties, through Darwinian natural selection. Language is a complex, specialized skill, which develops in the child spontaneously, without conscious effort or formal instruction, is deployed without awareness of its underlying logic, and is qualitatively the same in every normal individual (Pinker and Bloom 1992: 452, 475, 486; Pinker 1995: 4–6, 20). In the words of Noam Chomsky:

language learning is not really something that the child does: it is something that happens to the child placed in an appropriate environment, much as the child's

body grows and matures in a predetermined way when provided with appropriate nutrition and environmental stimulation (Chomsky 1988: 62).

As is now widely recognized, the communicative advantages afforded our species by language call first of all for natural (or sexual) selection as the mechanism by which this cognitive device has come about. Like the eye, language has positive fitness implications in that it enables crucial information to be transmitted more efficiently between individuals than by non-linguistic means. All modern humans possess the same biologically given aptitude for language acquisition, which in our ancestral past proved adaptive to the hunting-gathering way of life (Workman and Reader 2004: 251; Hurford 1999: 177, 184; Clark and Clark 1978: 228).

In the absence of any permanent records of the sounds produced by the early humans, any attempt to place the origin of syntactic speech in some timeframe will always remain conjectural. The modern *Homo sapiens* (from about 170,000 years ago) had skulls like modern humans, and must probably have had language. Steven Pinker argues that the language instinct was probably in place long before the spectacular cave art and other decorated artefacts of the Cro-Magnon humans in the Upper Palaeolithic (Pinker 1995: 388). Merlin Donald also speculates that the advantages that the linguistic skill must have produced were in response to the particular environmental stresses introduced by the last Ice Age (75,000–10,000 BCE). Conditions of life in the Northern Hemisphere were extremely difficult at the time, which might have demanded a new adaptation. Survival in the cold climate, under the arduous conditions of a nomadic existence that was dependent on hunting for large game, required better social co-ordination and planning. Added to environmental pressures was competition with rival hominids, who were battling for roughly the same, huge ecological niche. In the event the syntactic Cro-Magnon eliminated the proto-syntactic Neanderthals, who were stronger and more robust than modern humans, but probably lacked symbolic language. Both sub-species were able to adapt to the harsh glacial climate, but major evolutionary advances were probably driven by cognitive competition between the two human species, giving the linguistic *Homo sapiens* an ultimate upper hand over their pre-linguistic rivals.

Like contemporary hunter-gatherers, their Upper Palaeolithic predecessors were accomplished tool makers and superb amateur biologists with detailed knowledge of the life cycles, ecology, and behaviour of plants and animals they depended on. Language would surely have been useful in such a lifestyle, by enabling its users to communicate precise information about time, space, and objects in the natural environment, as well as about the intricate social relations, mutual commitments, obligations and alliances (Pinker 1995: 404). Organized group hunting in particular required co-ordinated social participation in the chase,

effective social control of food sharing, and unambiguous knowledge about who does what, with whom, with what, where and when (Crook 1980: 130). Visual communication is of limited use during the group hunt, with the hands busy holding weapons and the eyes fixed on the tracks and the pursued game. During marching or running through dense overgrowth hunters often do not even see one another, calls of warning, simple vocal instructions and commands remaining the only viable way of effective and quick communication needed to co-ordinate the chase. Given the preference for meat in early *Homo*, Steven Mithen also suggests that increased consumption of meat obtained by group hunting or scavenging involved food sharing, division of labour, and organization of movement around a home base. Combined with pair bonding and male investment in child rearing, these socio-economic conditions in turn led to prolonged infant dependency and childhood learning, facilitated by the communicative abilities of the verbal language (Mithen 1999a: 100–103).

The ever-growing complexity of social life in the early hunting-gathering communities also appears to have required syntactic speech as an effective method of interpersonal communication to facilitate social negotiations and to ensure stability of social life. Derek Bickerton argues that the main reason for the explosive growth of brain-size in humans (over threefold within the last three million years, creating the highest brain-body ratio of any species in earth) is the unprecedented mental capacity of language (Bickerton 1990: 44). Within the human brain, the prefrontal cortex is more than twice as large as what would be expected for a primate with a similarly sized brain. Although the prefrontal cortex is not considered a “language area” per se, it appears to play a critical role in language processing: it is the primary area for working memory, that is, for storing representations in the mind for immediate use – a computation that is crucially involved in both producing sentences and comprehending their meaning (Hauser 1998: 113; Frankish 2000).

For Robin Dunbar too the dramatic increase in hominid brain size is directly related to group size and language as a means of integrating the group and diffusing social tensions. According to Dunbar language evolved as a form of social grooming. Among the primates tactile grooming is usually a one-to-one activity, which creates social bond and cohesion, in addition to releasing chemicals known as opiates into the brain, which result in a feeling of contentment and pleasure in the individual being groomed (Dunbar 1996: 4). As Dunbar demonstrates, living within a larger group requires more brain-processing power to keep up with the ever-changing sets of social relationships. Among the primates the principal way to transfer information between individuals is by grooming each other’s bodies, because grooming is as much about sending social messages as about removing parasites. Dunbar argues that as the social group got larger, language evolved to provide a means for exchanging social information, initially as a supplement to

grooming, and then as a replacement for it. Language is a much more efficient way of transferring information, because grooming is a one-to-one activity, while one talker can be heard by many listeners (Dunbar 1996: 7–15; 2003: 220; 2005: 112–114). Steven Mithen also suggests that vocal grooming in its earliest stages must have been closer to song than speech, which can explain the relaxing, emotional, and social nature of music. The early grooming speech was also probably dominated by soothing emotive vocalizations such as sighs, quiet grunts, purrs, hums and so on (Mithen 2005: 136).

Dunbar's "social brain hypothesis" explains why the social domain features so prominently in our conversations even today. About two-thirds of our total conversation time is dedicated to social topics: what we like and dislike, what others are up to, how someone behaved, is it a good or a bad thing, who is in and who is out, who needs a favour and who is in a position to offer one, who is trustworthy and who is a liar, who is available and who is under the protection of a jealous spouse or family, how the children are coming along, how to deal with a difficult situation and so on. All the rest – politics, culture, science, philosophy, art, technical topics, music, sport – takes up a mere third of our conversation time. The same proportion is reflected in the subject-matter of the books and magazines published each year or of TV programmes: about two-third is fiction unfolding intimacies of the main characters, especially in romantic contexts. Equally popular are the retellings of the life experiences of the rich and famous, with intimate details and gossip of their private lives (Dunbar 1996: 5, Barkow 1992). As Pinker also points out, gossip is a favourite pastime in all human societies, and the practical knowledge it provides gives people obvious strategic advantages in the games of life. In the small bands in which our minds evolved, everyone knew everyone else, so all gossip was useful (Pinker 1998: 540).

Dunbar has also observed a striking difference in the interest in social affairs by the two sexes. While there are practically no differences between men and women today in the amount of time devoted to talking about social matters, there are significant inter-sexual differences in the choice of conversation topics depending on the composition of the group. In unisex groups males and females spend just as much time discussing personal relationships and experiences, but in mixed sex groups talking about work, academic matters, religion, ethics and politics among males increases dramatically by up to twenty per cent. According to Dunbar, male conversations in mixed companies function as a kind of "vocal lek" (leks are animal display areas where males gather to advertise their qualities as potential mates to the females). When men talk about politics, hunting, warfare, sport, professional life, and other traditionally male activities, particularly when women are listening, they do so as a form of self-advertising and personal and/or sexual display (Dunbar 1996: 175; Barrow 1995: 81). Across cultures loquacious

males are perceived as more interesting and appealing, even when they are not especially physically attractive (Woody Allen comes to mind). Anthropological studies indicate that tribal chiefs are often both gifted orators and highly polygynous, suggesting that linguistic skills can make a Darwinian difference (Pinker and Bloom 1992: 483).

The psychologist Geoffrey F. Miller also argues that language was under the control of sexual selection rather than natural selection, and evolved as a means of showing off how good our genes are before prospective partners. Language, and by extension artistic creativity may thus have evolved as signals of genetic fitness to potential mates and competitors. Miller's argument is that language may have originated as a means of enabling the process of competing for a mate, and only later was used for all its other purposes. Miller points to the phenomenon of verbal courtship, or the "gift of the gab," as an example of the importance of language in the dating game. In the context of sexual selection men are verbal peacocks, using language to impress women during courtship. For their part, women use language less as a tool during mate selection (they rely on their looks instead) but rather as a method for holding an already existing relationship (Miller 2000b: 5–13). This is why when men talk about social life they tend to talk about *their own* experience and activities, while women tend to talk about *other people's* lives. Men also tend to have larger vocabularies than women, but women score, on average, more highly on tests of verbal fluency than men (Cartwright 2000: 155; Workman and Reader 2004: 276). While men use their knowledge and social prestige before women to win their favours, women "modestly" and quietly gather useful information about other people for the purpose of networking, bonding, and smooth daily running of social life. A typical male discourse conducted within exclusive male groups, traditionally mostly in the context of hunting and warfare, would also be expected to be dominated by curt, laconic, unemotional and impersonal instructions, commands and prohibitions. On the other hand, one would expect a typical female discourse within unisex groups to be dominated by "quiet," affirmative, descriptive, personal, occasionally emotionally agitated but otherwise tension-free, characteristic of situations of safety, relaxation, and non-emergency (Sadowski 2001c: 87).

Language and the problem of reference

Syntactic, combinatorial language is probably the most effective form of communication so far invented, one especially suited to the increasingly complicated social life of our ancestral environment. Early on humans fell into a lifestyle in which the survival of groups and individuals depended on extended co-operation and efficient communication in matters relating to food, nurturance, safety, and

reproductive opportunities. This lifestyle presented extraordinary opportunities for evolutionary gains and losses, benefiting long-term co-operation and also detecting cheaters. As Steven Pinker and Paul Bloom emphasize, interacting with other individuals of comparable mental abilities whose motives are at times outright malevolent makes formidable demands on cognition. For this reason in all cultures social interactions are mediated by attempts at persuasion and argument. Equally universal are attempts at sussing other people out using second-order intentionality (guessing what others may think), as well as learning of other people's desires and obligations through gossip. Early humans lived in a world not unlike ours in this respect, in which language was involved in the intrigues of politics, economic exchanges, familial and sexual relations, and friendship. Within a group of interdependent, co-operating individuals, the mental states and intentions of other individuals are among the most important things worth knowing and talking about (Pinker and Bloom 1992: 483).

Equally important is the way language was able to facilitate the accumulation and quick diffusion across the group of the knowledge about the environment, as well as its non-genetic transmission from generation to generation. Cognitively advanced *Homo sapiens* acquire a great deal of information during their lifetimes, at a rate far exceeding the slow accumulation of genetic knowledge through natural selection. A species such as ours, equipped with a communication system able to spread quickly useful knowledge about the constantly shifting contingencies of the environment, can gain a decisive advantage in competition with other species, such as the Neanderthals, that can only defend themselves against new threats in evolutionary time, through natural selection (Pinker and Bloom 1992: 460). The possibility of development, adaptation, and avoidance of competition by non-genetic means has been one of the most important pay-offs from the evolution of human brain complexity. By passing on ideas through social interaction by means of language, gestures, visual images and symbols, human cultural development has proceeded far more rapidly than by coding particular types of information in genes. Moreover, the information that can be passed on by behavioural and cultural means is of the type that cannot be transferred by genetic inheritance. Indeed, the phenomenon of culture refers precisely to the specifically human practice of communicating social knowledge by means of extra-biological inheritance. This usually occurs via language as the quickest and most effective way of exchanging ideas. By comparison, non-verbal, visual communication is more limited and slower, as in individuals watching one another to imitate motor skills. Syntactic speech remains therefore the most effective means of transmitting cultural knowledge, as evidenced by gossip, religion, or science (Plotkin 1994: 213, 224; Barrow 1995: 82).

Language obviously requires the necessary, genetically pre-programmed brain circuitry and appropriately developed vocal anatomy, but once acquired the novel

form of information transmission became partly decoupled from genetic inheritance, sending our hominid ancestors down a novel evolutionary path. The unique ability of language to code quickly new knowledge and quickly to diffuse it within the group has to do both with displaced referentiality and with language's syntactic, combinatorial, arbitrary quality – features that set language apart from any other system of animal and human communication.

Referentiality, that is, the ability of a signal or sign to denote something other than itself by having parainformation attached to it in the sender's and the receiver's minds, is found in most types of communication. It is present even in instances of emotive contiguous-indexical communication, when an involuntary physiological reaction, such as the bristling of the hair or perspiring, refers in a rudimentary way to an unseen inner state that elicited the external emotive symptom. At the other end of referential communication is human language, whose arbitrary symbols supported by combinatorial grammar can refer to a practically unlimited number of entities, both existent and made-up, across the broad spatio-temporal spectrum and all imaginable locations. In the animal kingdom referential signals are favoured in social species where individuals occasionally leave the core of their group and consequently have the opportunity to encounter objects or events that are relevant to other group members: food, predators, mating opportunities, dangerous neighbours and so on. Compared with the scale of human referential communication, however, animal signals have their referential capacity usually limited to a single context. For example, the dance of the honeybee is clearly referential and even exhibits the property of displacement – the ability to refer to an object that is spatio-temporally removed from the sender. But even when they are functionally referential, animal signals are restricted to one or a small number of contexts. Nevertheless, referential communication is one that was enhanced over evolutionary time because of its adaptive usefulness.

In human language too the words' ability to refer to actions or objects that are external to the speaker is the basis on which all the more sophisticated functions of language are dependent. That is to say, whatever the subsequent influence of language on thought and internal representation of the world, its communicative capacity to refer to external objects or events must be considered primary, as evidenced by all animal communication systems (Allen and Sidel 1998: 188–190). Referentiality is also the main criterion in Saussure's classic definition of the linguistic sign, which accordingly “exists only through the associating of the signifier [the form of the sign] with the signified [the concept the sign refers to].” Saussure compares the two-sided linguistic unit to a chemical compound like water, a combination of hydrogen and oxygen neither of which, taken separately, contains any of the properties of water (Saussure 1974: 102).

Thus understood communicative nature of language should remain obvious enough, if not for the attempts by postmodern theorists to “transmogrify” (as Raymond Tallis puts it) Saussure’s ideas, by claiming that referential discourse is impossible both because extra-linguistic reality lies beyond the reach of language, and because the apparent extra-linguistic realities are in fact the product of language, that is to say, they are intra-linguistic. In what Tallis calls an “anti-Saussure-an use of Saussure’s concepts” by theorists such as Barthes, Lacan, and Derrida, Saussure’s inseparable connection between signifier and signified has been severed. In consequence, dispensing with the signified, that is, with referential meaning, has reduced language in some academic quarters to the futile “free play of the signifier,” as evidenced by the incomprehensible mumbo-jumbo of postmodern discourse (Tallis 1995a: 49, 54, 84–86, 88). Saussure’s own warning about separating the signifier from the signified was the following: “whenever only one element is retained, the entity [of the linguistic sign] vanishes; instead of a concrete object we are faced with a mere abstraction” (Saussure 1974: 103).

The origins of arbitrariness

The effectiveness of a referential system of communication can be measured by the amount of information transmitted in the unit of time with the least ambiguity and the greatest intelligibility. In this respect iconic systems, for all their advantages discussed in Chapters 7 and 9, are comparatively inefficient by being slow and ambiguous. Except in limited contexts of pictorial instruction or facial recognition, an image can suggest rather than precisely indicate, and its holistic nature prevents quick succession of signals to speed up the transmission of detailed information. By contrast, more complex communication systems involving arbitrary signalling units allow for concatenation and hierarchical structure, which greatly increase both the speed of transmission and the meaning generating capacity (Dingwall 1979: 21).

Indeed, arbitrariness of linguistic units and combinatorial grammar are closely intertwined: once a sign has lost its iconic, inherent semantic quality, its sole communicative function was to serve as an abstract, contrasting unit in a system where meaning is conveyed through recombination of signs with no meaning of their own. Thus in the word *cat* neither the overall sign (spoken or written) nor its constituent phonemes (or letters) in any way resemble either the whole cat or any of its anatomical or behavioural features. Except for cases discussed in Chapter 9, words are linked to meaning not through physical resemblance but as a result of rote learning during language acquisition. Arbitrary signs are just mnemonic tags, and any sign could do just as well. In this way, to communicate some abstract idea

all a user of an arbitrary system such as language needs to do is to retrieve from memory the word that matches the corresponding concept. If instead the sender was to shape a visual sign to convey the same idea using some recognizable connection between its form and its content, every word would require either a prepared picture as an illustration of the concept, or an amusing but inefficient pantomime, as in the game of charades (Pinker 1995: 80, 156; 1997: 163). Iconic features of language such as onomatopoeia or synaesthesia certainly exist to add intuitive colouring to the meaning, but they are footnotes to the far more important principle of the arbitrariness of the sign – or else we would understand the words in every foreign language instinctively (Pinker 2001: 2). In arbitrary language sound or image is (generally) free from perceptive associations with its original, be it an object, emotion or attitude, and it can therefore be freely manipulated and recombined. For this reason arbitrary signs are most useful in coding highly abstract and precise ideas, especially the non-emotive, non-perceptual, and often counterintuitive concepts of science, as in physics and mathematics. In this way arbitrary symbols enable humans to transcend the perceptual and cognitive limitations of phylogenetically more archaic emotive and iconic forms of communication (Wierciński 1983: 43).

At the same time, as Terrence Deacon observes, symbolic communication does not grow logically and automatically from non-arbitrary (emotive and iconic) communication. The cognitive “jump” from analogue to digital communication is hard to explain, as even a small, inefficient, and inflexible symbolic system is very difficult to acquire (*vide* experiments with teaching human language to chimpanzees) (Deacon 1997: 379). Even for humans learning a new symbolic system can be difficult. For instance, the system of raised dots for the use of the blind, known as Braille, is based on an arbitrary code, developed along logical rather than psychological lines, and is very difficult to master (Geldard 1977: 215). Notwithstanding the working of the innate language faculty to get the process of language acquisition started, a symbolic system depends on substantial external social support in order to be learned, and forces one to employ counterintuitive learning strategies that may interfere with non-symbolic social communication such as emotive vocalizations, facial expressions, and gestural displays. Indeed, the counterintuitive nature of symbolic communication, in particular the arbitrary connection between sound and meaning in words, has challenged thinkers since before recorded history, and it continues to plague every field where explanations of thought processes are attempted. Deacon admits that thousands of years and thousands of texts later we still do not fully understand the cognitive basis of symbolic reference – the relationship that invests words with their meanings. From the evolutionary point of view linguistic reference is anomalous: symbolic communication does not logically derive from iconic or indexical communication, and

words and sentences have no counterparts in the rest of the biological world. This means that we do not really understand one of our most commonplace and species-defining experiences (Deacon 1997: 51).

Equally mysterious is the transition from holistic protolanguage to fully syntactic speech. As suggested by Studdert-Kennedy and Goldstein, the initial enabling condition was probably the fact that semantically holistic utterances physically consisted of discrete phonetic symbols, randomly concatenated into strings of “phonetic gestures.” In this way compositionality could emerge because holistic utterances readily fractionate along the fault lines of their discrete components, eventually leading to segmentation into what we now call words (Studdert-Kennedy and Goldstein 2003: 238). The linguist Alison Wray also hypothesizes how the syntactic, analytic system could arise during the protolanguage period, supplementing and enhancing the capacity of the holistic message inventory (vocal manipulative expressions of greeting, warning, commanding, threatening, requesting, appeasing and so on). The analytic protolanguage could have evolved first by isolating single referential words for objects, persons, and actions (that is, nouns and verbs) from holistic utterances, particularly those entailing displaced originals. This in turn made possible the independent expression of new, informative statements by juxtaposing these lexical items, even though the inherent ambiguity, deriving from the absence of grammar, constrained the power of this new means of expression. Accordingly, the first step towards combinatorial grammar would have been segmentation, the dividing up, probably along phonetic lines, of the whole utterance into meaningful subunits. If in two or more semantically related utterances there were chance matches between phonetic segments and aspects of meaning, then it would seem as if there was a constituent with that meaning. In a hypothetical example, if a holistic phrase *tebima*, meaning *give that to her*, co-existed with *kumapi*, meaning *share this with her*, then it might be concluded that *ma* had the meaning *female person + beneficiary* (Wray 2000: 296). Arbitrary sequences of sounds could thus become associated with particular referents: persons, animals, objects, actions and so on through repeated use. In the early stages the simple analytic system was still insufficient for the subtle social interactions required for individual and group survival, which means that it had to co-exist with the protolinguistic holistic expressions (Wray 2002: 118, 133). With time, the isolated lexical items, especially those referring to absent objects and persons, could be manipulated mentally more freely, precisely because of their detachment from immediate, contiguous reference. This is how, according to Wray, linguistic compositionality could have emerged, the feature that eventually made language so much more powerful than holistic, situation-bound communication systems.

How language produces meaning

From a systems point of view language, like all organized systems, consists of interrelated elements. On the syntactic level the constituent elements of language are its lexical items, or words, while the relations between the words are defined by rules of grammar. For Steven Pinker similarly the ingredients of language are words and rules: words in the sense of memorized links between sound and meaning; rules in the sense of operations that assemble the words into combinations whose meaning can be computed both from the meanings of individual words and from the way they are arranged in an utterance (Pinker 2001: 300). Both the words and the rules of grammar were invented because they served clear pragmatic and referential functions: the words provided lexical and conceptual equivalents to objects, actions, and states, while the grammatical categories such as the subjunctive, the conditional, the idea of plurals and tenses, of conjugations and declensions, of active and passive voice and so on, helped to clarify the relations between the words/concepts in intelligible utterances. The origin of words and rules was thus closely related to their anticipated and perceived usefulness to the growing human cognitive and communicative agenda.

The word as the smallest semantic unit that can be moved around in an utterance is based on a memorized arbitrary pairing between sound and meaning. During language acquisition people tacitly agree to use a particular sound to convey a particular idea. For example, a combination of phonemes forming the English word *rose* brings to the minds of English speakers an idea of a sweet smelling flower with thorns, not because of any possible indexical or iconic link between the word and the flower called rose, but because users of English have all learned the same link between a combination of sounds making up the word *rose* and the concept of a rose. (Shakespeare's Juliet famously and aptly observes: "What's in a name? That which we call a rose by any other word would smell as sweet" [Shakespeare 1994: 129]). Today's adult speakers of English dispose of a production vocabulary of 20,000 to 50,000 words, and comprehension vocabulary is considerably larger. An average child from the age of two onwards acquires around ten new words a day to arrive at a vocabulary of about 14,000 words by the age of six. Growth in vocabulary from then on to about age seventeen averages at least three thousand new words a year. By that age young language learners are exposed to some 85,000 distinct word-roots and at least 100,000 distinct word-meanings in their school textbooks alone (Clark 1993: 13).

The word, and collectively the lexicon, is the primary symbolic device in the referential system that links phonetic utterances with the world. However, the phonological and the syntactic systems alone cannot generate meaningful sentences, if by "meaningfulness" we understand internal representations (concepts)

relating to outside entities such as people, objects, events, the categories they belong to, their distribution in space and time, and their causal relations to one another. Pinker and Bloom list the following kinds of contents, or types of meaning, worthy of communication among humans: to be able to refer to individuals and classes; to distinguish among basic ontological categories (things, events, places, times, manners *etc.*); to distinguish the participants in the event or state according to role; to identify the intentional states of ourselves and others; to express distinctions of truth value and modality (necessity, possibility, probability, factuality); to comment on the time of an event or state; to encode an unlimited number of predicates, arguments, and propositions; to use the same propositional content within different speech acts such as questions, statements, or commands (Pinker and Bloom 1992: 460; Crook 1980: 134; Clark 1993: 44–47). In other words, language has “meaning” if it mentally connects its structures with persons, objects, events, actions, and states existing in the outside world.

This means that the meaning of a word in the brain cannot be a definition entirely in terms of other words or symbolic devices, because reference ensures that language is an open, not a closed system. Each lexical entry, or word, is the centre of a complex network that contains four classes of information: 1/ meaning, or reference; 2/ syntactic properties, including the category of the entry (for example, verb); 3/ morphological details, such as affixes for plurals, cases, or tenses; and 4/ phonological information, including syllabic structure and accents (Donald 1991: 251; Pinker 2001: 24). Which is not to say that language is unimaginable without referential meaning, relying only on syntactic, morphological, and phonological rules but not on semantic ones. Word-play or metaphysical speculation, for instance, seem to thrive on grammatical rules alone, by producing statements with no discernible connection with the world outside the employed discourse. The occasional separation of semantics from other linguistic structures is possible due to so-called “double articulation,” or “duality of patterning,” which divides language into two distinct levels of organization: phonology and morpho-syntax. For James R. Hurford the two levels of language organization are semi-autonomous, and only the morpho-syntactic level is linked to the logical forms of semantics and the possibility of referential meaning. This effectively means that language has two quite distinct sets of rules for “putting things together:” phonological rules which put individual consonants and vowels together to make syllables and basic grammatical units called morphemes, and syntactic rules which take these elements and put them together to make (possibly) meaningful utterances (Hurford 2002: 319). This also means that it is possible to generate linguistic utterances using only the rules from the morpho-syntactic level but without engaging the logical forms that link syntax with semantics. This explains why it is so easy to produce grammatically correct but meaningless (that is, non-referential) sentences.

However, if symbolic language has arisen historically as a system of communication, its referential and representational function must be considered primary, as language's evolutionary *raison d'être*, with its non-referential uses as possibly accidental although culturally consequential by-products.

On the morpho-syntactic level language users do not just string together isolated words; they combine them into phrases and sentences, in which the meaning of the combination can be inferred both from the individual meanings of the words involved and from the rules combining the words. Which is another way of saying that the meaning of a phrase or utterance is more than the sum of meanings of the constituent words. Nor can we derive the meaning of a word from the phonetic elements that compose it. By a similar token, in a physical domain we cannot derive the fire-extinguishing properties of water from the combination of hydrogen (which burns) and oxygen (which sustains burning), nor the properties of proteins from the genes that control their formation (Studdert-Kennedy and Goldstein 2003: 237). Thus the word *dog* on its own refers to any domesticated canine mammal, whereas the combined phrase *mad dog* forms a new semantic entity, in which the meaning of one word is modified by the other grammatically related word. Here the word *mad* does not just refer to any person or animal being insane, but specifically to a dog, while *dog* as a generic member of the canine family is narrowed down in the phrase to a dog that happens to be mad. On top of that the entire phrase *mad dog* can assume a metaphoric, connotative meaning when used to describe an uncontrollably violent person for example. In all other "dog"-related phrases, such as *cats and dogs*, *dogs of war*, *a dog's life* and so on, the specific meanings, both denotative and connotative, are created by the meanings of the individual words involved, modified by the rules binding the words together in the phrase.

Not any combination of words is allowed, but only those controlled by the rules peculiar to language: we say *cats and dogs*, but not *dogs and cats* (grammatical but stylistically incorrect), or *and casts dogs* (ungrammatical). After Noam Chomsky it is widely accepted that in the mind of every language user there is an innate Universal Grammar as the generator of rules specific to a particular language, which determine how words may be arranged into grammatically correct combinations. The set of these rules is referred as *generative grammar*: it assembles words into phrases according to the words' functions, or part-of-speech categories, such as noun and verb. The rules of generative grammar are also productive (hence the adjective "generative"): by specifying kinds of words (a noun, a verb, a determiner *etc.*) rather than actual words, the rules allow the speaker to assemble new sentences without having to regurgitate preassembled clichés, thus permitting an unprecedented number of combinations of sentences and associated ideas. For instance, we can say *mad dog*, but also *doggy dog* or *stuffed dog*, just by substituting adjectival phrases. The combinatorial nature of grammatical rules allows every

position in a sentence to be filled with a choice of words from a lengthy lexical list (Saussure 1974: 124–126; Pinker 2001: 4–8). In this way, by substituting every position in the sentence with new words from the list of nouns, verbs, adjectives, prepositions and so on, one can generate a practically infinite number of grammatical (if not always meaningful) sentences.

One of the most important features of language as a communication system able to refer to things displaced in time is *recursion*, a grammatical rule whereby the verb phrase, or sentence, can contain another verb phrase or sentence (Pinker 2001: 9–11; Johansson 2006: 7; Bloom 1998: 211). The recursive power of syntax allows us to describe objects and events to a potentially infinite degree of embedding, as in *he thinks that she knows that he persuaded etc.* In the sentence *I told him he could watch that film later on DVD*, the sentence *he could watch that film later on DVD* is embedded in the sentence *I told him*. The recursive rule can repeat itself practically *ad infinitum*, creating a string of embedded sentences, like a Russian doll. A human being possessing a recursive grammar can express or understand an infinite number of distinctive thoughts, referring to events distributed across the entire time scale, as befits a species with an extended working memory (Brandon and Hornstein 1986: 185). For instance, in the sentence quoted above we are in fact dealing with three separate moments in time: the present time in which the sentence is spoken, the past to which the sentence refers (*I told him*), and an unspecified future any time after the moment denoted by *I told him* (which could be between the past event and the present, or even beyond the present, if *he* from the sentence has not yet seen the film in question). Recursion is a powerful communication device for exchanging precise information about time, space, objects, and about who did what to whom and when. Without recursion it would not be possible to exchange propositions about the specifically human higher-order intentionality, or gossip, as in the sentence *He knows that she thinks that he is having an affair with Ann*. Without recursive grammar language would not be such a powerful tool of persuasion, argument, hypothetical speculation and social negotiation. If reference, another important feature of language, has its antecedents in animal communication, even in creatures as small and otherwise cognitively primitive as the honey-bees, recursion appears to be the only attribute of the human language that lacks any parallel within animal communication systems.

Other possible sources of language: sexual selection and gestures

It seems clear, especially with the benefit of hindsight, that a system of communication based on symbolic reference across the entire time spectrum must have given its users an adaptive edge by conferring some reproductive advantage over

ecological competitors such as the non-symbolic and contiguity-bound Neanderthals. Increased survival due to success in hunting in the harsh conditions of the last Ice Age must have been among the chief benefits of efficient social communication based on syntactic language. At the same time Terrence Deacon argues that the transition from mimetic to symbolic culture was also due to sexual (as well as natural) selection. His line of reasoning is the following: in hunting-gathering communities the only way that males, while away on hunting, could be ensured of the fidelity of their females was the social institution of marriage. In order to prevent, or at least to reduce, mistrust and jealousy, couples made public and binding promises of sexual fidelity to each other. Because the promise referred to future and possible events, it could only be expressed through symbolic signs: social ceremony, gestures, objects (such as today's wedding ring), and communication systems using displaced referents, such as language. Non-human primates are under no pressure to speak or to use visual symbols, because they communicate only about the currently experienced world, and anything important in it can always be pointed out, literally, by manual gesture or emotive vocal signalling. On the other hand humans, with their extended perception of time, make social contracts by agreeing to share and enforce an abstract idea referring to some future eventuality. Since physical referents denoted by contracts do not (yet) exist, Deacon argues that the only way to convey information about a contract would have been to establish a suitable symbol. This symbol would be likely to derive from some ritual action involved in cementing the contract (as a wedding ring might come to symbolize marriage). With recurrent use, such ritual symbols became reduced to shorthand, and were eventually given verbal, also symbolic equivalents (Deacon 1997: 402, 406).

Another recurrent social situation which may have given rise to, or at least may have greatly encouraged symbolic thinking is the "sham menstruation" phenomenon, which the anthropologists Chris Knight and Camilla Power argue was practised by the Palaeolithic women (probably as far back as 100,000 years). As I already mentioned in Chapter 4 in connection with bodily adornments and the beginnings of referential communication, sham menstruation was a fiction-generating strategy in which newly fertile females were bonded in coalitionary alliance with their pregnant and nursing mothers, sisters, and other kin. Women apparently developed this strategy to avoid being made pregnant and then abandoned by their mates. Sham menstruation was designed to conceal the precise period of ovulation, extending the female's receptivity beyond the fertile period, thus keeping the male sexually interested over an increasingly extended period. As in the case of the marriage contract emphasized by Deacon, sham menstruation presupposed extended working memory as a psychological prerequisite for a symbolic solution to an adaptively important problem – the long-term male commitment to his sexual

partner and her offspring. According to Knight and Power, symbolic culture could thus emerge to offset the danger of menstruating (that is, fertile) women being seduced by philandering males. To hide the signs of imminent fertility in a menstruating female, other women painted their bodies red, thus publicly advertising their own potential fertility to attract male attention to their group in general, at the same time hiding the individual, truly menstruating women from the attention of philanderers. By bonding together closely, the young woman's female kin would temporarily bar male sexual access to her and would scramble her signal, packaging the released information in a form that philanderers could not use. The persistence of such "blood" coalitions led eventually to the conventionalization of signals into symbolic signs and the stabilization of "blood"-symbolized kin-coalitions (Knight 1991; 2002: 151; Power 1999; Watts 1999: 137; Davidson 2003: 154).

On the other hand, Merlin Donald speculates that the most likely initial source of arbitrary symbols at the time when iconic communication still predominated were not vocal communication or conventionalized bodily displays, but the standardization of mimetic visual performance – that is, gesture. Gesture is still closely tied to speech in modern humans, and some of the gestural expressions are what Donald calls "emblematic" – stereotypical signs carrying part-iconic part-symbolic specific meanings: for example, thumbs up for "OK," or index finger circling the temple for "psychologically peculiar." All cultures have some system of expression involving facial and postural attitudes to express approval and disapproval, anger and sadness, puzzlement, derision and so on. Gestures may have started out as variants of emotional expressions, with time to become the most rudimentary symbols, that is, symbols still close to a mimetic level of representation, such as shrugging the shoulders, pursing the lips, shaking the head to indicate puzzlement, waving and smiling to greet someone, shaking hands and so on. Putting the fingers to the lips and producing a "shh" sound indicates silence both in modern Western culture and among the Kalahari Bushmen. Donald argues that gesture and speech both have mimetic origin and share a computational stage, indicating that they may have developed together up to a point (Donald 1991: 220, 224). In the event speech overtook gestures in combinatorial development to form the main symbolic system among humans, largely due to the aforementioned physical advantages of the auditory medium, including the comparatively high speed of signal emission, and the freeing of the hands and eyes from communicative function.

The co-evolution of vocal language and gestural communication is also endorsed by the psychologist Michael C. Corballis, who argues that gestures are neurophysiologically synchronized with speech, and that the two channels of communication form a single, integrated system. When people are prevented from speaking and asked to communicate with gestures, their gestures spontaneously take on syntactic elements. Infants exposed to a sign language learn it as naturally

as those who learn to speak, and perhaps even more quickly. The main argument in favour of evolutionary pressure on gestural communication is the bipedalism of early hominids, attested already for *Australopithecus anamensis* (some 4,2 million years ago), which freed the arms and hands from primary involvement in locomotion, and opened up the frontal stance. Corballis suggests that these development led the hominids to discover natural (that is, iconic) relationships between their own gestures and events in the physical world. Mimed communication could thus have been a precursor to language, which accordingly progressed from mimed sequences to a more abstract and conventionalized system, much as do present-day sign languages. After the emergence of the genus *Homo* about 2,5 million years ago, gesture may have begun to acquire syntactic structure, while the vocal elements were gradually introduced, eventually to dominate over gestural communication, as the hands became more involved with other activities, such as carrying and manufacturing (Corballis 2002: 161, 170, 175; 2003: 214, 216).

With evolutionary hindsight, symbolic communication appears “overdetermined,” as Terrence Deacon puts it. Almost everything points to it: it bestows clear advantage in organizing hunts, sharing food, exchanging views about social realities, planning warfare and defence, passing on tool-making skills, sharing important past experiences, establishing social bonds between individuals, manipulating potential sexual competitors or mates, caring for and training the young and so on (Deacon 1997: 377). The ecological success of symbol-using humans compared with non-symbolic primate species or the Neanderthal humans indicates that there must be a significant reproductive advantage conferred by language.

Ethnically differentiated languages must also have played a significant role in maintaining group cohesion and communal identity in opposition to the outsiders (Knight 1999: 243). Iconic signs alone, due to their reliance on universal, species-specific perceptual automatisms and cognitive processes, tend to display considerable inter-cultural intelligibility, and their role in demarcating group boundaries is therefore limited. The arbitrary signs of speech on the other hand rely on group-specific learning practices, resulting in the emergence of sharp inter-group boundaries, separate communal identities and cultural developments, including the Tower of Babel of thousands of mutually unintelligible ethnic languages of the world.

From an evolutionary point of view the diversification of languages is in itself a puzzling phenomenon. Given the fact that language evolved to allow information to be exchanged, why do languages diversify so rapidly that they very quickly become mutually unintelligible? There are now some 6,000 living languages in the world, plus an untold number that have already become extinct. Languages also spawn dialects with unseemly speed, and dialects in turn eventually give rise to new languages. Robin Dunbar suggests that since it is probably not beyond the wit of evolution to have produced language structures that are resistant to corruption,

so if languages diversify so easily it is probably because they have been deliberately selected to do so. One answer is simply drift: the gradual accumulation of accidental mutations (mispronunciations *etc.*) over long periods of time. Another reason, a selective one favoured by Dunbar, is the need to differentiate communities, mainly to eliminate free riders – individuals who take the benefits of co-operation but do not pay the costs. Dialects were thus probably designed to act as badges of group membership that allow everyone to identify members of their exchange group simply by the way they speak (Dunbar 2003: 229–231).

Neither the diversification of ethnic languages nor the combinatorial nature of language in general would be possible without the arbitrary nature of the linguistic sign, which liberated the form of the sign from the constraints of the emotive and iconic motivation, and consequently enabled the free manipulation of the sign through combinations and permutations to code meanings referring to things displaced in time and place. The switch towards arbitrariness thus moved human language onto a level of efficiency, flexibility, and precision unattainable by the more archaic, primate systems of communication. At the same time the recombination of phonemes and words to form grammatical sentences is only possible to a combinatorial mind, capable of producing discrete propositions about the existing and hypothetical situations, which means that syntactic language is as much about communicating complex information about the natural and social environments as about a new, specifically human way of thinking. As I noted earlier, language evolved through natural selection primarily for the function of communication, but its combinatorial structure also affected the thought processes (Pinker 1997: 169; Bloom 1998: 208). Without language, much of our conceptual thinking as expressed in religion, philosophy, science, law and politics would not exist. In the course of human cognitive evolution language and other modules of the mind entered into a competitive feedback loop, and as our ancestors' abilities to communicate increased, so did their social and conceptual capacities, which in turn created more pressure for greater communicative abilities, and so on (Bloom 1998: 204). This also means that while linguistic communication as an adaptation presupposes referential meaning, increased cognitive abilities facilitated by combinatorial language also make it possible to generate propositions with no equivalents in the empirical world – a curious, fascinating, uniquely human phenomenon of non-referential meaning, probably produced as a by-product of language conceived primarily as a system of referential communication.

Language and the symbolic compulsion

The combinatorial nature of syntactic language thus accounts for language's two-fold function: that of communication and cognition. As well as being a way of exchanging ideas about important facts of life, language is also an outward expression of an unusual mode of thought – symbolic representation. Symbolic thinking enables humans to live, uniquely among the animals, not only in the world of physical things, but also in a shared world of virtual, immaterial reality. People are not only alerted to the natural and social environments affecting them directly, but they also inhabit an invisible world of mental abstractions, impossibilities, and paradoxes, they brood over what could have happened but didn't, over what is likely to happen, and what it will be like not to exist. The generative nature of language, its ability to produce a potentially infinite number of sentences, gives rise to a corresponding number of possible concepts and propositions, some factual and some fictional. Within language's communicative function people tell stories about their own and other people's experiences, that is, about what really happened. On the other hand within language's cognitive function people also invent stories about imagined or impossible events, and they even make use of these stories to organize their lives, as evidenced by the social influences of religions and political ideologies. Like other animals, we think and exchange knowledge about perceptible material objects and important existential situations, but as humans we are not limited to the visible reality – we can also think about abstract and metaphysical entities, we tell jokes, narrate ghost stories, compose poems and music, invent myths of the origin of the world, write novels, or use mathematics to speculate about the physical nature of the universe. It is this ability of language and of the combinatorial mind to produce a new, virtual dimension of reality, a meta-version of the physically existing world that has created a huge cognitive gap between humans and all other species (Bloom 1998: 212).

As I argued in Chapter 2, communication in its simplest form requires an image, or perception of an objects or situation, and parainformation, that is, a mental association attached to that perception. Derek Bickerton describes the same process in terms of a primary system of representation, or what he calls "on-line thinking," in which sense perceptions of the world are mapped onto conceptual representations, as when an actual egg is reflected in the concept of an egg-shaped object in the mind of a bird, enabling the bird to recognize a real egg in its vicinity

and to react appropriately (protectively) towards it. In fact, everything that we or other creatures perceive is a representation, not naked reality itself. No creature receives from its senses more than a selection from the range of information that is potentially available. What is presented to any species, not excluding our own, by its senses is thus not “reality” but a species-specific view of reality – not what is “out there,” but what it is useful for the species to know about what is there. Necessarily partial and biased as the primary representation of reality is for animals, at the same time that view cannot stray too far from the surface of things-as-they-are. If it did, animals would be presented with counterfactual evidence, and would quickly starve or be killed and eaten (Bickerton 1990: 13, 82, 209).

All animals relate to the outside world through the primary system of representation (parainformation), but only humans can avail of metainformation, that is, of associations about associations, or what Bickerton refers to as a secondary system of representation, or “off-line thinking,” when conceptual representations are mapped onto another system of mental representation such as language (Bickerton 1996: 40, 103–105). Other meta-cognitive phenomena such as inner dialogue, fantasizing, or philosophizing are all secondary systems of representation in the above sense. The cognitive scientist Dan Sperber similarly argues that during the course of evolution the human mind has evolved a biologically unique, species-specific module of “meta-representation.” Whereas the other cognitive modules contain concepts and (primary) representations of things, Sperber suggests that this new module integrates the other modules to form “concepts of concepts,” or “representations of representations” (Sperber 1994: 42–46). It is clear that just as primary systems of representation offer a necessarily fragmentary, species-specific picture of what the world is really like, secondary systems of representation distance the observer from the external world even more, often to the point of distorting it completely, as in fantasies, delusions, dreams, or hallucinations. Even science – offering a most reliable description to date of what the empirical world is probably like – is basically a metainformational, cognitively secondary phenomenon, as is consciousness, that uniquely human sense of knowing that one knows. Paradoxically therefore, progressive distancing from the external world caused by these meta-cognitive devices is the price humans pay for consciously knowing anything about the world at all.

It’s not all in language

Syntactic language and other meta-cognitive faculties appear to be closely interrelated in the mind, but not in the sense that we “think” in a particular language: English, Chinese, or Polish. The “language” of thought, or what Steven Pinker calls

“mentalese,” shares with verbal languages a basically combinatorial and propositional structure, and our thoughts can of course be translated into verbal equivalents. At the same time the fact that there can be two thoughts, or concepts, corresponding to one word (e.g. “stool”), means that thoughts and words are not one and the same thing (Pinker 1995: 75, 77; 2007: 55–58). Mental life goes on largely independently of particular language, as otherwise personalities, cultures, value systems, and lifestyles would all be direct functions of a particular, unique ethnic language. Both individual personalities and ethnic cultures do differ of course, but not as widely as the phonological, lexical, and grammatical systems of unrelated languages, and *not* as a result of the language individual people and communities happen to be using. There can be wide differences between the personalities and lifestyles of people sharing the same ethnic language, just as people speaking different languages can be similar in all other psychological and cultural respects. Translating books from one language to another makes sense precisely because people from different linguistic communities can have common, mutually intelligible mentalities and outlooks, to say nothing of human nature as the generator of the universally understood basic templates of human experience and social relations.

Important as language is for human communication and cognition, its impact on our thinking must not therefore be overstated. Many experiments have probed the minds of creatures without language, such as infants and nonhuman primates, and have discovered the fundamental categories of thought fully in operation: objects, space, cause and effect, number, probability, agency (the initiation of behaviour by a person or animal), and the functions of tools (Pinker 2002: 210; Hurford 2002: 312). Deaf children (never exposed to spoken language) using hand signs pass through exactly the same developmental stages as speaking children, and the language that emerges from their gestural signs has the same characteristics of grammatical structuring as the verbal language (Plotkin 1994: 201, 205). As individual introspection also demonstrates, there is a general poverty of language when it comes to dealing with most visual and auditory stimuli that constantly attack our senses, with our emotional states, or when describing facial expressions or facial identity (Magee 1998: 95). Experiences such as pain and love, sensual pleasure of sex and food, contemplation of music and so on are notoriously difficult to communicate through language, and probably impossible to describe fully. Most sensations and emotions can only be shared experientially, but not communicated verbally. What it effectively means is that the language faculty co-exists with but does not determine or dominate other cognitive modules – it is primarily a biological adaptation to communicate information, and not an insidious shaper of thought and feeling (Pinker 1995: 6; Carruthers and Boucher 1998).

The opposite view, one proposing that language strongly influences the way people perceive the world and think about it, has been known as linguistic

determinism, and has been one of the most influential schools of thought in twentieth-century linguistics, psychology, philosophy, and anthropology. The linguistic determinism hypothesis concentrates on the differences in both vocabulary and grammar between different languages and suggests that speakers of a particular language are led to think, perceive and remember the world in a way peculiar to that language. Consequently, users of different languages will tend to view the world differently. In anthropology the hypothesis of linguistic determinism is also known as cultural relativism, the latter associated with the anthropologist Franz Boas (1858–1942), who inspired his student, the linguist Edward Sapir, into a belief that languages carve up the world into categories according to which people perceive and understand the world (Sapir 1985: 69). Sapir's own student Benjamin Whorf stretched this observation into the famous linguistic determinism hypothesis, whereby nature is cut up and organized into concepts codified in the patterns of language, which determine the way the users of the language perceive reality (Whorf 1940: 229–231; 1956; Lund 2003: 10; Pinker 2002: 207; 2007: 124–136).

Like all one-sided, deterministic positions, the linguistic determinism/cultural relativity hypothesis offers only a partial and therefore distorted view, here of the relations between the mind, language, and the world. The hypothesis effectively implies that the fundamental categories of reality are not “in” reality itself but are imposed wholly by one's culture, in practice by language. But as I said earlier, the fact that translations from one language to another are possible appears to indicate that thought and culture are not functions of a particular ethnic language. Also, people do not absorb and use their native languages passively, but allow the linguistic structures to interact with their minds, feelings, and individual experience to shape their language creatively by coining new words and expressions. Languages evolve and change, and not only due to their own inherent, independent dynamics but also thanks to the largely non-linguistic socio-psychological processes.

The linguistic determinism hypothesis also begs a fundamental question as to where the categories of a particular ethnic language come from in the first place. A sensible answer would probably have to consider sustained historical interactions between the linguistic community and the social and natural environments, the latter existing largely independently from the language the community happens to be using. According to the linguist Michael Lee, it is the structure of our everyday experience that is reflected in the structure of the language, rather than the other way round. As a system of communication language works within the confines of the real world, and is constrained both by the limitations of our neural hardware and by the particulars of observable reality. For example, we all feel the effects of gravity and enjoy the benefits of stereoscopic vision, and these shared experiences exert a force on the languages of all cultures, giving rise to some linguistic universals (Lee 1988: 211; Clark and Clark 1978: 227–230). As Steven Pinker also points

out, there is no scientific evidence that languages dramatically shape their speakers' ways of thinking; to the contrary, observations of deaf children and of people with linguistic impairments demonstrate development of alternative syntactic and symbolic forms of communication, such as sign languages or Braille (viz. the famous case of Helen Keller [1880–1968], a deaf-blind author, activist and lecturer, who achieved her academic accomplishments using the sense of touch alone). Despite their isolation from the verbal world, languageless adults display many abstract forms of thinking, such as rebuilding broken locks, handling money, playing card games, and entertaining each other with long pantomimed narratives (Pinker 1995: 49–51, 61).

A classic case in point in the debate about language and thought is colour perception and its relation to linguistic labels for colours. From a physical point of view the spectrum of light is continuous, not divided into discrete colours of the rainbow. The electromagnetic wavelength is a continuous dimension, and there is nothing to separate red, yellow, green, blue and so on into separate perceptual categories. But although there are no colour boundaries from a physical viewpoint, from a physiological point of view they do exist. Colour vision depends on the degree of stimulation of three kinds of cones, each with a different pigment, and the cones are wired to neurons in a way that makes the neurons respond best to red patches against a green background or vice versa, blue against yellow, black against white (Sherwood 1997: 178–180). The physiological basis of colour perception is thus independent of any language, which means that words for different colours are constrained by perception, not the other way round.

Wherever languages differ in their colour words, they differ in a predictable way, as the classic research by Brent Berlin and Paul Kay has persuasively demonstrated. Originally, investigations into the lexical domain of colour arose as an attempt to prove the Sapir-Whorf hypothesis, namely that languages vary without restraint, and since physically the colour spectrum is continuous, its division into discrete lexical items should be completely arbitrary. But Berlin and Kay have shown that this is not the case, because the focal points of colour terms (terms and colour that most speakers of a language agree on) are in fact determined by the neural anatomy of our colour vision. First of all, Berlin and Kay discovered that although different languages encode in their vocabularies different numbers of basic colour categories, a total universal inventory of exactly eleven basic colour categories exists (*black, white, red, yellow, green, blue, brown, purple, pink, orange, and grey*), from which any given language draws its basic colour terms. Some languages, like English, use all eleven, while others use as few as two. But when a language has only two, it does not pick just any two at random, but *black* and *white* (as “dark” and “light”).

The following strict limitations on the numbers and types of colour categories are also coded by any given language: when a language has three colours, it always picks *black*, *white*, and *red*; if a language contains four terms, then it contains a term for either *green* or *yellow* (but not for both); if a language contains five terms, then it contains terms for both *green* and *yellow*; if a language contains six terms, then it contains a term for *blue*; if a language has seven terms, then it contains a term for *brown*; and if a language contains eight or more terms, then it contains a term for *purple*, *pink*, *orange*, *grey*, or some combination of these.

These limitations also reflect the sequence of evolutionary stages through which a language must pass as its basic colour vocabulary increases. There also appears to be a positive correlation between general cultural complexity (including the level of technological development) and complexity of colour vocabulary. For instance, all the languages of highly industrialized European and Asian peoples have eight or more colour terms in their vocabularies, while all representatives of early stages (between two and four colour terms in their lexicons) are spoken by peoples with small populations and limited technology, located in isolated areas. The choice of basic colour terms in different languages is therefore far from random, because the very physiology of the human visual system makes some colours more salient than others. For example, children find black, white, and red eye-catching and easy to remember. Colour terminology is therefore universal because the physiology of the human vision has universal properties (Berlin and Kay 1999: 1–3, 10, 14, 16; Clark and Clark 1978: 232–234; Lee 1988: 216, 218).

The exclusive preoccupation with language and the related view that language is a paradigm for all other forms of communication have also led to distorted and confusing concepts and theories of culture. Contemporary communication studies, semiotics, literary and media studies derive their methodologies and critical vocabulary mainly from structuralist linguistics, quite irrespective of whether the object of investigation is linguistic communication or not. While the concept of the arbitrariness of the sign and the combinatorial nature of the code certainly apply to syntactic language, they do not necessarily reflect the character of the visual media such as painting, photography, drama or film. Syntactic language is indeed based largely on a digital code, but life-simulating visual media, like life itself, are mainly analogue, communicating their messages through holistic, unrecombina-ble gestalts. A classic case in point is the perception of the human face, in life as well as on a painted or photographic portrait, or in a cinematic close-up (Smith and Scott 1997). The face consists of certain typical elements such as the oval overall shape, the eyes, the nose, the lips, the ears, the cheeks, the forehead, the neck, facial and scalp hair and so on. Within limited quantitative variations all these elements can assume only one, familiar type of spatial arrangement to be perceived as a face. Rearranging these elements freely will not produce a new meaningful

image but a chaotic, Picassoesque picture of randomly scattered bits and pieces: here an eye, there an ear and so on. On the other hand in digital language a simple recombination of constituent elements such as phonemes in a word can turn one meaningful message into another meaningful message, as in turning the word *dog* into a semantically unrelated word *god* simply by reversing the order of the phonemes/letters. We cannot perform a similar trick with analogue and holistic visual messages: a painted dog will not turn into an image of “god” if we paint the dog facing the other way. This means that applying linguistic categories to analyses of paintings, photographs or of sequential narratives such as novels, plays or films is simply mistaken. One must therefore treat with a pinch of salt the frequently used by misleading critical vocabulary which talks about the “language” or “grammar” of film, or which uses the concept of “text” both in relation to alphabetic writing and to the narrative structure of a novel, to the visual spectacle of drama and film, or even to the history of the world (Merquior 1986: 248).

The excesses of language combinatorial machine

While on-line, adaptive thinking and denotative linguistic representation are constrained both by the physiology of sensory perception and by the physical properties of the environment, off-line meta-thinking and the connotative use of language are practically open-ended in the meanings they can generate. Human on-line thinking is a direct descendant of animal cognition, with its alertness to the ever-changing contingencies of life and to adaptively important situations such as food gathering, prey locating, intruder repelling and so on, which limit the number of problems that animals can communicate about. By contrast, in humans the capacity to think about one’s responses to life, coupled with the combinatorial nature of language as a medium with which to communicate one’s thoughts, produce a potentially unlimited number of possible topics of communication. While all other creatures can communicate only about things that have direct evolutionary significance to them, human beings can communicate about literally anything.

The unlimited semantic potential of human symbolic communication results both from the extended working memory, which enables us to hold in conscious attention events and possibilities far exceeding the limitations of the current moment, and from the combinatorial nature of language, which can transcend our perception of the here-and-now by generating propositions also about events that never happened and are never likely to happen. Each of us has a vocabulary of around 30,000 to 40,000 words, yet we are able to generate some 10^{30} (i.e. one with thirty zeroes behind it) different grammatical sentences of about twenty words in length. Even a comparatively small inventory of lexical elements can be assembled

by rules of grammar into an immense set of distinct utterances, whose number grows exponentially (geometrically) with the size of the combination. This means that if we never drew breath but just talked all our lives, we would utter but a tiny fraction of all the sentences we are capable of producing (Pinker 2001: 8; Plotkin 1994: 199).

The creative capacity of a combinatorial system applies also to another uniquely human form of expression: music, in that both language and music are capable of generating an unlimited number of novel sequences from a small number of basic ingredients. Just as speakers can produce sentences they have never heard before, so composers can write melodies which nobody has ever produced before (Sloboda 1985: 17; Bertalanffy 1981: 50). As the governess Maria, played by Julie Andrews, explains to the von Trapp children in the classic film *The Sound of Music* (1965):

When you read you begin with ABS, when you sing you begin with DO, RE, ME... DO, RE, ME, FA, SO, LA, TE are only the tools we use to build a song. Once you have these notes in your heads, you can sing a million different tunes by mixing them up. Like this: SO, DO, LA, FA, ME, DO, RE, SO, DO, LA, TE, DO, RE, DO. Now put it all together...

and there follows one of Rodgers and Hammerstein's unforgettable melodies. This extraordinary creativity of the human mind is qualitatively different from anything that any other species can produce in their pre-syntactic, holistic forms of communication. However, impressive as human linguistic creativity is, it is important to bear in mind that statistically speaking most sentences generated through a combinatorial grammar are nonsensical or false, in the sense of lacking any referential support in the extra-linguistic, outside world. The question is: what possible benefits can there be in exchanging ideas about non-existent objects, creatures, and events? Does not the resulting cognitive distance from and distortion of empirical reality undermine language's primary communicative function?

As I discussed in the previous chapter, language produces sentences through the operation of a number of interrelated cognitive modules, including a storehouse of memorized words (lexicon); a set of rules that combine words and parts of words into bigger words (morphology); a set of rules that combine words into phrases and sentences (syntax); a set of rules converting words, phrases, and sentences into sound patterns that speakers can pronounce or extract from the stream of noise when listening (phonology); and connections between the structure of language and the mind, defining what the speaker wants to say (semantics) (Pinker 2001: 24; Hurford 2002: 319). The sub-system of language that crucially defines its communicative function is the semantic module, which connects the combinatorial sub-systems of syntax, morphology, and phonology with the similarly combinatorial mind, creating the generative language machine mentioned above, capable

of producing an astronomical number of novel grammatical sentences. The mind contains, among many other things, the concepts of objects found in the empirical world, which can be converted into lexical equivalents used by the language machine to produce meaningful sentences, that is, sentences that refer to independently existing external objects and events.

But the vast combinatorial powers of language and mind go far beyond these referential propositions, which is why an overwhelming majority of what we are potentially capable of saying is meaningless: grammatical but non-referential. Chomsky's often quoted "colourless green ideas sleep furiously" is just one of an unlimited number of such nonsensical albeit grammatically correct sentences (Johansson 2006: 9). In fact, Chomsky's sentence is not only empirically untrue but also logically false: if something is green then it cannot be colourless; ideas cannot be green because they are invisible, immaterial entities; only living organisms can sleep, but not ideas; and when an organisms sleeps it cannot do so furiously, but only quietly. While for Chomsky the defining feature of language is indeed combinatorial syntax, his example also illustrates the danger of separating syntax from semantics. The above nonsensical sentence shows how mentally easy it is to separate the combinatorial language machine from meaning, not just from referential meaning but even from simple logic that can determine which theoretical propositions are true and which are not. In other words, it is clearly possible to allow the phonological, morphological, and the syntactic modules to operate without the related but apparently not indispensable semantic module that generates referential or plausible meanings. With the semantic module engaged language performs its primary communicative function by producing meaningful propositions referring to the relevant, actual or possible objects and situations in the outside world. On the other hand when the semantic module is disconnected, so to speak, from syntax language performs a non-communicative, solely cognitive function by generating meaningless, fictional propositions of disputable relevance to the outside world. That is to say, there is no empirical equivalent of the hypothetical situation described in Chomsky's sentence about colourless green ideas that sleep furiously.

It is this capacity for unbridled linguistic productivity and equally unrestrained combinatorial thinking that makes possible such cognitive phenomena as myth, poetry, fantasy, and delusion. The one great advantage of combinatorial language is that it can produce messages, both factual and fictitious, much more quickly and easily than, by comparison, holistic acoustic and visual messages produced by the primates, and obviously more quickly and easily than the phenotypic communicative displays produced by the slow evolutionary process. At the same time, as the linguist Andrew Carstairs-McCarthy observes, the very ease, speed, and versatility of language make it cheap to use for spreading deceptive information, mainly to

gain advantage over one's fellows. By contrast, signals which are expensive to produce, like elaborate plumage as part of a mating display in birds, are hard to fake and therefore reliable (Carstairs-McCarthy 2000: 261). Even deceptive animal signals such as mimicry take evolutionary time to produce, and once produced they remain fixed, inflexible, and limited in scope. On the other hand, the messages of human combinatorial speech can be produced and changed quickly and with negligible physiological cost which, combined with human capacity for meta-thinking, creates extraordinary and unprecedented opportunities for deception, including self-deception, as well as apparently profitless and impractical fantasizing (Clark 1998).

Human language appears therefore to be a mixed blessing. On the one hand it has proven to be the most efficient way ever invented by evolution of exchanging adaptively important and necessarily truthful and accurate information about the environment. On the other hand the combinatorial nature of language has produced an easy, quick, and physiologically cheap way of generating and disseminating information that is blatantly untruthful and inaccurate in the empirical sense. One can only surmise that if language has arisen through natural selection, then probably on balance the benefits of language's communicative function have outweighed its potentially counter-adaptive capacity to produce fictitious and possibly harmful descriptions of the world. That is to say, the truthful propositions of language, congruous with empirical reality, have proven advantageous enough to offset the possible disadvantages of untruthful models of the world that have accompanied humanity since time immemorial: especially the linguistically formulated religious models, with their self-deceptive, factually wrong accounts of the origin, structure, evolution, and ultimate goal of the universe and of human life in it. It is one of the great miracles of the human condition that the same system of communication that gave our species an unprecedented evolutionary benefit – the capacity to represent the world quickly, cheaply, and accurately – has also given us the power to represent practically anything, whether true or false, whether adaptively significant or not. Still, the communicative benefits of language are evidently so enormous that members of our species can produce and believe in a great deal of empirically untrue propositions, often leading to dysfunctional behaviour, and still survive (Bickerton 1990: 20).

Such mixed blessings are not unknown in evolution. In addition to adaptations, that is, anatomical and behavioural features that enhance survival, the evolutionary process often produces other outcomes visible in the designs of organisms, including random effects as well as by-products of adaptations (so-called "spandrels," after a comparison with the triangular spaces formed as incidental architectural by-products by the intersection of arches supporting the dome of the cathedral of San Marco in Venice) (Gould and Lewontin 1979: 581–590). For the

biologists Stephen Jay Gould and R. C. Lewontin these concomitants of adaptations, or exaptations, are those properties of the phenotype that do not contribute to the organism's functional design, but happen to be coupled to properties that are, and so were dragged along into the organism's design because of selection on the design features to which they were linked (Gould 1991: 43–54; Buss et alii 1998: 534–538; Tooby and Cosmides 1992a: 62; Fernald 1992: 392–395). For example, bones are adaptations, but the fact that they are white is an incidental by-product (bones were selected to include calcium because it conferred hardness and rigidity to the structure), and it simply happened that the insoluble calcium salts that are a constituent of a bone are white in colour. Similarly with the red colour of blood: blood cells, or erythrocytes, are essentially plasma membrane-enclosed bags of haemoglobin that transports oxygen to tissues. It just happens that because of its iron content haemoglobin appears reddish when combined with oxygen (and bluish when deoxygenated).

By the same token it is possible to view some aspects of human cognition, especially certain manifestations of meta-thinking such as art, religion, and philosophy – the so-called “spiritual culture” – as an evolutionary incidental by-product of the linguistic and related mental modules, primarily selected for by the demands of efficient communication in the tough conditions of life in the Pleistocene period. Symbolic and combinatorial language as a secondary system of representation, coupled with the capacity for meta-thinking afforded by consciousness, plus the theory of mind, extended working memory and the resulting teleological need, have all detached human cognition from the primary, or parainformational, system of representation inherited from our animal ancestors, and have given us the mental wherewithal to produce such uniquely human artefacts as fictional literature, poetry, mythology, religion, mysticism, magic, artistic visions, philosophic speculation, and scientific theory. As a result we not only live in the physical world of things registered through our primary systems of representation, but we also inhabit a virtual world of symbolic stand-ins for things invented by secondary systems of representation. With the exception of science, all symbolic domains are essentially non-referential in character, in the sense that they do not denote things that exist anyhow – the repertoire of “things” referred to by most of symbolic culture simply has no existence outside a symbolic context (Dunbar 1995: 132).

The belief in the existence of otherwise non-existent symbolic entities, however, can serve important social and cognitive needs: it can cement the group and provide answers, factually wrong but psychologically useful, to the uniquely human metaphysical and teleological questions regarding the possible purpose and meaning of life. Symbolic entities universally include supernatural beings (deities, ghosts, demons, hobgoblins, monsters *etc.*); elements of mythical cosmology (paradise, hell *etc.*); social roles and institutions (emperors, priests, presidents, *etc.*);

objects endowed with symbolic meaning (totems, sceptres, national emblems *etc.*); abstract moral concepts (sin, evil, redemption *etc.*); ritual acts (baptism, signing an agreement, taking an oath *etc.*); or values (religious faith, patriotism, virtue, being cool, chic and so on) (Chase 1991: 34–36; Blackmore 1999: 188). All cultures, regardless of the level of their technological and social development, have used symbolic language and the combinatorial mind to generate elaborate virtual realities described by religions, ethnic mythologies, and popular culture. Even the most isolated modern human groups live mentally within such virtual, symbolic realities. For example, the Tasaday of the Philippines, the pygmies of the African rain forest, and the Bushmen of Southern Africa when first contacted by Europeans still had the same type of tool culture associated with the very earliest modern human remains discovered by archaeology. But they all possessed elaborate spoken languages with complex grammars and highly developed tribal structures, rituals, mythical cosmologies, and religions with their supernatural beings (Donald 1991: 206, 210–212; 2001: 168–199).

Some of the symbolic domains found in human cultures past and present are adaptive and utilitarian (e.g. law, science); some, such as art, folklore, and mythical cosmologies, are probably indifferent to survival; and some may be deleterious, as when a person's or a group's religious beliefs are challenged by unorthodoxy from within, or threatened by an incompatible symbolic universe of another group, leading in individual cases to serious existential crises and even to suicide, or giving rise to bitter violent conflicts between groups for no other reason than because both sides strongly believe in different symbolic, supernatural entities that have no objective validity anyway. All cultures possess their own versions of symbolic domains invented for the purpose of consolidating relations between members of the group, of justifying political structures and the prevailing ideologies, of asserting group identity, and of allaying individual metaphysical anxieties, but it is also clear that the symbolic entities performing these important social functions have no independent, empirical existence outside the meta-cognitive sphere of collective belief.

The conceptual indulgence of philosophic discourse

The unquestioning faith that usually accompanies claims about the world made within different symbolic domains is not limited to religion and its supernatural premises, but can be found as a cognitive disposition underlying equally uncritical beliefs in any symbolic system, be it secular political ideology, philosophy, or academic theory. Science too is ultimately a product of abstract thought rooted in the combinatorial, symbolic mind, but unlike all the other symbolic systems science makes a point of limiting its claims about the world to those that can actually be

empirically proven through observation and experiment. In scientific thinking there is a constant two-way flow of information between the sensory, primary representations and the linguistic, secondary representations, whereby a new observation can inductively inspire a new scientific concept, just as an a priori deductive concept can be immediately checked against observational evidence. Out of an infinitely large number of propositions that can be potentially produced by language, science accepts only those that are verifiable and therefore relevant to the world in which we live. On the other hand no verification is as a rule required in support of philosophic propositions, whose validity is usually founded on the personal authority of their propounders, on current intellectual fashion, and on group solidarity among intellectuals rather than on objective evidence.

Non-referential or self-referential symbolic systems such as philosophy are driven on the one hand by human psychological compulsion to search for the meaning of life, and on the other hand by the compulsion of the combinatorial language machine that generates both meaningful and meaningless sentences with equal ease. (In fact, meaningless sentences are even easier to produce than meaningful ones, because they do not require an additional reality check.) Unlike religion philosophy is usually also a product of highly literate cultures, where models of the world are created by manipulating the visual elements of an exteriorized and more or less fixed written text, rather than by using volatile and emotive spoken language. Because of its permanent character, writing is even more removed from external, physical reality than speech: it is a representation of a linguistic representation of a conceptual representation of the experienced world (Harris 1986: 27; Ong 2004: 40, 81; Frankish 1998). It is therefore easier to treat words on a page as entities in themselves rather than as signs referring to external entities such as concepts as the words' mental equivalents, and by extension to referents outside language. Because of language's compulsion to "idle," as it were, the philosophic discourse thus produced is often of doubtful relevance to the realities of life. As the contemporary philosopher Bernard Williams observes sceptically: "at all times, and in all eras, and whoever's doing it, at least ninety per cent of philosophy, on a generous estimate, is not much good, and is never going to be of any interest much to anybody later on except historians" (Magee 1978: 121).

The separation of lexicon and syntax from semantics, which lies at the basis of much of philosophic discourse, is also facilitated by the arbitrary nature of the linguistic sign. Arbitrary symbols signify, but they do not model or reflect meaning, as iconic signs do. Spoken or written words are not models of anything but only the objective carriers of information, arbitrary access devices for addressing certain memories. Arbitrary symbols exist therefore on another level of representation than iconic signs, and are more detached from their referents than iconic signs are from theirs. This is why with language, especially with writing, it is so

easy to ignore the problem of reference, and to produce discourse that refers to nothing but itself (as in Derrida's dictum that "there is nothing outside the text"). This is also why in lexicography the "meaning" of a word is not defined by its external reference, but by means of other words. As Merlin Donald puts it:

Within the self-contained world of language, to find the meaning of a word in the mind one merely looks up its definition, or searches through a mental filing system; or reduces it to a set of elementary symbols or semantic markers. In all three cases, there is no need to leave (that is, refer outside of) the symbolic system (Donald 1991: 227; 2001).

The cognitive distance between arbitrary written signs and the empirical world facilitates therefore the free manipulation of the former, as arbitrary symbols can be easily detached from their particular referents (provided they have any at all in the first place). At this abstract level of literacy, as Ellen Dissanayake notes, ontological, ethical, and political statements in a text can be analyzed not in terms of their extra-textual meaning but of their linguistic function, a tendency pushed *ad absurdum* by some contemporary intellectuals, who seem to have replaced the traditional philosophic quest for the meaning of life with the quasi-linguistic quest for the meaning of words.

In Dissanayake's words, "the immemorial discourse on the universe is transfigured by and into the concern for the adequate universe of discourse" (Dissanayake 1991: 178). In his turn Bertrand Russell had this to say about the danger of the philosophers' obsession with language:

Philosophers and bookish people generally tend to live a life dominated by words, and even to forget that it is the essential function of words to have a connection of one sort or another with facts, which are in general non-linguistic. Some modern philosophers have gone so far as to say that words should never be confronted with facts but should live in a pure, autonomous world where they are compared only with other words. When you say, "the cat is a carnivorous animal," you do not mean that actual cats eat actual meat, but only that in zoology books the cat is classified among carnivora. These authors tell us that the attempt to confront language with fact is "metaphysics" and is on this ground to be condemned. This is one of those views which are so absurd that only very learned men could possibly adopt them (Russell 1975: 110).

As Bryan Magee also observes, postmodern theorists in particular have credited language with an absurdly disproportionate importance in human life and experience, treating it as the main object of interest, an end in itself, a self-referential subject matter of its own messages. Magee compares these thinkers to "a man who sits all the time polishing his glasses, but never puts them on his nose and looks through them at the world" (Magee 1978: 121; 1998: 111).

There is a pertinent story about the linguist Edward Sapir, who had been working with an informant on an American Indian language with a grammar that he was having trouble sorting out. Finally, Sapir felt he had caught on to the principles involved, and to test his hypothesis he began making up sentences in the language himself. "Can you say this?" he would ask his informant, and would then produce his utterance in the informant's language. Sapir repeated this several times, each time composing a different expression. Each time his informant nodded his head and said "Yes, you can say that." This apparently was confirmation that he was on the right track. Then an awful suspicion crossed Sapir's mind. Once more he asked "Can you say this?" and once more received the answer "Yes." Then he asked, "But what does it mean?" "Not a darn thing!" came the reply (Weinberg 1975: 56). In other words, having grasped the grammatical rules of the language Sapir set the combinatorial syntactic machine in motion, generating more and more novel sentences, but because they were produced outside the communicative context of real experience, they were grammatical but meaningless, syntactic but non-semantic. One is reminded of a scene from Woody Allen's film *Love and Death* (1975), set in early nineteenth-century Russia, in which a jealous husband slaps his wife's lover on the face with a question "Shall we say, pistols at dawn?," to which the challenged lover, played by Allen, responds in Groucho Marx style: "We can say it. I don't know what it means, but we can say it."

In a similar way much of the discourse produced within philosophy appears to result from the working of the combinatorial mind and equally combinatorial language, but not necessarily from reflection on actual experience or from observation of the world. Once referential semantics is taken out of the equation, linguistic self-indulgence can generate any number of grammatical propositions that are elegant and even thought provoking, but largely irrelevant to the world in which we live because simply untrue. Propositions thus produced can be found in numerous contemporary scholarly publications, especially in postmodern theory. For example, one often reads that people are sometimes aggressive because their culture socializes them to be violent; that men are jealous of their sexual partners because they are conditioned to be so by the patriarchal culture in which they grow up; that men subconsciously desire to kill their fathers and copulate with their mothers; that women envy men their penises; that gender is a social construct and can be freely chosen; that rape is about power and not about sex; that from a woman's point of view all sexual intercourse is rape and marriage is a form of slavery; that people's minds are blank slates at birth; that women like looking attractive because they have been sexually objectified by the "masculine gaze"; that people cannot understand anything apart from the linguistic constructs imposed on them by society; that human identity is unstable and infinitely malleable; that human nature does not exist; that cultural universals do not exist; that language

does not connect with anything beyond itself, and that linguistic meaning is indeterminate; that a discrete and independent human mind is a myth; that in literature there is no such thing as authorial intention, and that all creation is in fact borrowing and re-creation; that the unconscious is structured like language; that all scholarly research is political; that being determines consciousness, and so on and so forth. As in the earlier-quoted anecdote about Edward Sapir, one can ask if it is possible to say all of these things. Yes, it is not only possible but also very easy to think, say, and write such propositions, because their production does not require any proof except personal belief, ideological commitment, and wishful thinking. But what do thus formulated propositions mean? Not a darn thing. The above claims are either empirically totally untrue, or at best in need of substantial revision and correction. They are modern intellectual myths, many of them rooted in the Leftist political radicalism of the 1960s, invented by academics for the purpose of beguiling their colleagues and impressionable undergraduates, but they are not valid propositions designed to test the empirical parameters of the socio-cultural realities as they actually exist.

The surrender of many academics to the symbolic compulsion of language, and the resulting view that empirical reality is not so much reflected as miraculously called into being by the sheer power of words, have led to the now common but perversely misleading habit of “writing” various things, as opposed to “writing *about* things,” as normally used to be the case. Thus among the titles of books, articles, university courses and conferences one frequently finds expressions such as “writing the nation,” “writing identity,” “writing the body,” “writing sexuality,” “writing the city” and so on. In the past the use of the preposition *about* or *on* after “writing” correctly indicated that the thing in question existed prior to being described and interpreted in writing by someone. Now the omission of the preposition implies against all evidence and common sense that the act of writing creates things *ab nihilo*, as in magic where verbal charms and incantations are believed to produce tangible results in the physical world. We are told, for example, that the female body is “written,” “invented,” and “culturally constructed,” as if the existence of biology and anatomy depended on whether we talk about them or not. There seems to be no doubt that social discourse affects the way we understand and interpret certain facts, but it does not affect the very existence of those facts (Bolin 1996: 36).

The fact that the combinatorial machine of syntactic language can be activated so easily, and that the virtual symbolic reality thus generated is so psychologically compelling should not absolve intellectuals from exercising mental discipline to sift meaningful claims from meaningless ones, mainly by applying rules of logic and by respecting evidence; in other words, by reconnecting syntax with semantics. Chomsky’s grammatically correct but semantically nonsensical furious sleep

of colourless green ideas illustrates the danger of ignoring both logic and extra-linguistic reference, as spectacularly evidenced by postmodern criticism, whose authors seem to have abandoned all intellectual responsibility of explaining the cultural realities, and have taken to playing pointless word games and writing mumbo-jumbo instead. This deploring intellectual fashion has been deservedly ridiculed in the Bad Writing Contest run from 1995 to 1998 by Denis Dutton from the journal *Philosophy and Literature*, which celebrated the most stylistically lamentable passages found in scholarly books and articles (Dutton 1998: 1; Myers 2005: 354). In 1998 for example the first prize went to Judith Butler, a Guggenheim Fellowship-winning professor of rhetoric and comparative literature at the University of California at Berkeley. Butler's prize-winning sentence appears in her "Further Reflections on the Conversations of Our Time," an article published in the scholarly journal *Diacritics* (1997):

The move from a structuralist account in which capital is understood to structure social relations in relatively homologous ways to a view of hegemony in which power relations are subject to repetition, convergence, and rearticulation brought the question of temporality into the thinking of structure, and marked a shift from a form of Althusserian theory that takes structural totalities as theoretical objects to one in which the insights into the contingent possibility of structure inaugurate a renewed conception of hegemony as bound up with the contingent sites and strategies of the rearticulation of power (Dutton 1998: 2).

Perfectly grammatical if perhaps too long and convoluted, Butler's sentence contains words of such a degree of semantic abstraction and vagueness that they can mean almost anything. Other recipients of the first prizes in the Bad Writing Contest included such luminaries of postmodern theory as Homi K. Bhabha, a professor of English at the University of Chicago, and the cultural critic Fredric Jameson.

Ironically and depressingly, some of the worst academic writers are highly-paid English professors working at prestigious universities, who have evidently abandoned the old-fashioned useful task of expounding the complexities of the literary canon to less prepared readers, and have embraced instead the pretentious and obscure psychoanalytic, Marxist, feminist, and deconstructive gobbledygook to talk about popular culture in general. If theology is a good example of a discipline with a method (deduction) but without a subject, postmodern theory is a classic example of a discipline with a subject (society, culture, language and so on) but without a method. Once the central premise of theology – the existence of the eternal, omniscient and omnipotent god – is accepted, all the subsequent arguments follow with unassailable logical consistency. On the other hand, if there is such a thing as the central premise of postmodern theory, it is (probably) that everything is relative and unstable – but what follows is a conceptual chaos in

which everything can mean anything, and in which nothing is discovered but everything is invented.

The humanities' physics envy

Why should many academic humanists resort to such woeful and unnecessary linguistic habits? Raymond Tallis interprets the popularity of the originally Francophone postmodern theory in the Anglophone universities in terms of the terror of insularity on the part of British intellectuals, who have uncritically embraced Parisian ideas to be thought of as more cosmopolitan and less chauvinistic (Tallis 1995a: xiv-xvi). The biologist Peter Medawar in turn suggests that postmodernism and humanities in general appear to suffer what he calls "physics envy." Arts scholars want to be thought profound, but their subject is actually easy compared with sciences, so they have to language it up to redress the balance (Dawkins 2003: 8). The biologist Paul R. Gross and the mathematician Norman Levitt also talk about the contradictory attitudes of postmodern thinkers towards Western science, who on the one hand blame it for the atrocities committed in the twentieth century, while at the same time they cannot help silently admiring science for its achievements and the practical benefits it brings. For instance, postmodern critics seem untroubled by the fact that their denunciations of Western scientific epistemology are composed on word processors, whose very existence derives from a subtle understanding of the universe encoded in quantum mechanics, and that their often indispensable spectacles depend upon the light – via the science of optics – of the rationalism and empiricism of the Enlightenment and the Scientific Revolution (Gross and Levitt 1998: 220). The ambivalent attitude of postmodernism towards science was brilliantly exposed by the now famous hoax, perpetrated in 1996 by the physicist Alan Sokal on the editors of the prestigious American journal *Social Text*. Sokal submitted to the journal's editors a parody paper called "Transgressing the Boundaries: Towards a Transformative Hermeneutics of Quantum Gravity," which was crammed with nonsensical, but unfortunately authentic, quotations about physics and mathematics by prominent French and American intellectuals (*Sokal Hoax* 2000: 11–47). The paper was accepted by the editors probably because it came from a physicist and because it said all the politically correct things that the editors of *Social Text* evidently wanted to hear: the attack on "post-Enlightenment hegemony" and on such unfashionable notions as the existence of the real world. From a scientific point of view, however, Sokal's paper was brimming with absurdities and blatant non sequiturs, proclaiming categorically for example that physical reality, no less than social reality, is at bottom a social and linguistic construct. By a series of stunning leaps of logic, the paper arrives at

the conclusion that “the π of Euclid and the G of Newton, formerly thought to be constant and universal, are now perceived in their ineluctable historicity,” and that quantum gravity has profound political implications. The rest of the article is in the same cultural relativist and social constructivist vein (*Sokal Hoax* 2000: 16).

In a detailed disclaimer to his hoax, submitted to *Social Text* but not surprisingly rejected and published elsewhere, Sokal explains that in addition to a mélange of half truths, obvious falsehoods and non sequiturs, his original article contained “syntactically correct sentences that have no meaning whatsoever.” He regrets not having been able to include more of the latter: “I tried hard to produce them, but I found that, save for rare bursts of inspiration, I just didn’t have the knack” (Sokal and Bricmont 1998: 248). Postmodern theorists, with their evident knack for meaningless and pretentious gibberish, can find additional help in a computer programme designed in 1996 by an Australian academic Andrew Bulhak called *Postmodernism Generator*, available on the Internet, which produces random, meaningless and yet quite realistic pseudo-academic texts. The programme is based on Bulhak’s technical paper called “On the Simulation of Postmodernism and Mental Debility Using Recursive Transition Networks.” Every hit on the website will be rewarded with an apparently serious academic paper, written in grammatically faultless but nonsensical sentences, complete with numbered footnotes (<http://www.elsewhere.org/pomo>). In its first two years online, the *Postmodernism Generator* delivered more than half a million essays – each wholly original and all utterly meaningless (Wheen 2004: 86; Dawkins 2003: 62). My own few hits produced within seconds fully annotated essays with the following promising titles: “Capitalist Subconceptual Theory and Postsemiotic Nationalism,” “Pretextual Feminism and Postdialectic Modernist Theory,” “Dialectic Appropriations: the Cultural Paradigm of Narrative and Sontagist Camp,” “The Context of Defining Characteristic: Dialectic Posttextual Theory and Nationalism.” It really is good fun (up to a point), unlike reading Derrida or Lacan for example. This is because reading parody or fiction is entertaining, whereas reading fiction masquerading as fact is simply irritating, as any attempt to fool one usually is.

The Sokal hoax may have been “a sham that shook the academy,” but the debate it engendered among philosophers, scientists, sociologists and literary scholars has had, sadly, little or no effect on postmodern theory and practice. More than a decade after the event, postmodernism’s influence on university curricula, on publishing and personnel policies in academia remains powerful. An honest debate between humanists and scientists, one that would encourage a much needed radical re-evaluation of the theoretical foundations of humanistic inquiry, and a possible rapprochement between the two cultures, still remains a vain hope. A virtual lack of response by postmodern critics to the substantiated charges of obscurantism and of deliberate obfuscation of science, levelled both by scientists and

by dissenting humanists, seems to indicate that the intellectuals whose main self-imposed task is to “critique” culture and society are impaired in their own critical judgment, by refusing to take on board any criticism of their own critical methods (Sokal and Bricmont 1998; Patai and Corral 2005). Resistance to criticism usually bespeaks a symbolic compulsion, abundantly illustrated by the history of religious and political dogmatisms, with their dichotomous, exclusive, intolerant logic of “us” versus “them,” in which “them” includes everyone outside one’s own community united around the same self-deceptive symbolic system. The refusal to accept empirical evidence or logical arguments as criteria with which to validate general propositions about the world thus places postmodern theory on a par with religious cults and political parties, with their similar group solidarity and unquestioning faith in inspired leaders and their “scripture.” As in cults and political movements in the world of postmodern theory there are also egos and careers at stake: one somehow does not expect senior academics who have built their scholarly reputations by writing politically correct nonsense suddenly to make a U-turn and publicly confess that they have been wrong all their professional lives (although public admission of mistakes is routine in science, which is why science can make real progress [Dawkins 2006c: 31]). But if the two cultures are ever to merge to form a unified vision of the world, their coming-together would also have to include accepting by the humanities a degree of methodological rigour, intellectual honesty, and healthy self-criticism that typically characterizes scientific inquiry.

What will hopefully emerge as a result of the possible rapprochement between the arts and the sciences should be a conceptual and methodological unity, in which the humanities, traditionally inspired mainly by philosophic speculation, will draw closer to the more up-to-date vision of the world produced by sciences, to partly fuse with them (Tallis 1995b; Wilson 1998: 9; Pinker 1999: 21). This would have to happen if the arts disciplines are to stop being trapped in their own, self-generated virtual reality largely divorces from the world as we know it. In the process the humanities should re-establish their relevance to the socio-cultural realities that it is their historic mission to interpret and explain in a reliable and adequate way. This would probably require abandoning philosophy-inspired, self-indulgent intellectual habits of allowing language’s combinatorial machine to idle without any checks on the veracity of thus generated propositions, followed by an adoption of science-based respect for logic and evidence. In the study of the products of the human mind such as art and literature, the new, science-inspired humanities would have to accept that we will not understand human intelligence, social communication, and culture until we understand how these seemingly unnatural attributes are deeply rooted in human biology, and consequently in human evolution (Plotkin 1994: xiv; Barrow 1995: 4, 246). When the biological determi-

nants of behaviour are ignored or dismissed, the debate about human mind and culture becomes, in the words of one of Oscar Wilde's characters, "a metaphysical speculation, and like most metaphysical speculations [it] has very little reference at all to the actual facts of life, as we know them" (Wilde 1994: 366).

Thus in the place of the fashionable notions of cultural relativism and social constructionism, the new humanities would have to appreciate that by virtue of being members of one biological species all humans have the same, fairly stable adaptive mechanisms in the form of universally developing cognitive specializations. In consequence, certain fundamental ways of thinking will be the same everywhere, without needing to be socially transmitted. Due to the innate adaptive mechanisms one should not expect cultural differences to vary continuously along all imaginable dimensions, but one might expect a limited number of recurring patterns, both within and across cultures (Tooby and Cosmides 1992b: 211, 215).

The methodological fusion between the arts and the sciences has for decades now been advanced by scientists, many of whom were quoted in the present book, but the urgent need to draw the two cultures together has also been advocated by individual humanistic scholars, especially by those inspired by evolutionary theory. For example, the new discipline of bio-epistemology, promoted by the literary scholar Nancy Easterlin, aims at nothing less than restoring literary (and cultural) studies, including communication studies, to a central position in culture and education, in the form of what Easterlin calls "a revised and informed humanism." Rather than seeing human beings as evolution's greatest achievement and the centre of the universe, a new humanism would be guided consciously – and with some humility – by the awareness that our knowledge is not absolute because it is inevitably human, constrained by the limitations of our cognitive apparatus. In contrast to traditional liberal humanism, the new humanism, based on the bio-epistemological perspective, will reconnect humanistic disciplines with life through scientific insight, thus leading not to the spiritualization of things human but to a bio-cultural perspective that allows us to speculate on the function and meaning of human culture within the context of the social and natural environments that have produced the human species (Easterlin 2005: 633).

Drawing on recent research in psychology and linguistics, Easterlin addresses the central problem of literature – the emergence of narrative – by stressing its indispensable role in human mental and social life. What all narrative forms across cultures and epochs have in common is that they all give meaning to social and individual events and mental states, and their production and dissemination depend on the retention of action and thought in memory – that uniquely human cognitive attribute. Narrativity – defined as the ability to organize actor, action, goal, scene, and instrument into a sequential story – is thus a primary form of cognition in social interaction, quite independently of language acquisition. From

a psychological point of view the basis of narrativity are not linguistic structures but memory founded on the predisposition to discover causal order and meaning in nature. Narrativity is therefore an adaptive tactic, because the intelligibility of events resulting from narrative constructs is correlated with a feeling of control and mastery over lived experience (Easterlin 2005: 628; Turner 1996: 25).

For Joseph Carroll too the verbal narrative is the main aesthetic construct that best fulfils the teleological function. The narrative is universally based on the same form, involving individual human characters in a social context, engaged in goal-oriented action, conflict and resolution. Producing and consuming narratives are a universal human disposition, which in itself is indirect testimony to the adaptive character of the arts, which supply a psychologically indispensable link between conceptual models of experience and the biologically constrained and emotionally mediated dispositions that we call human nature. The purpose of the narrative, as in religious myth, folk tale, philosophic discourse and work of literature, is to represent human experience, and just as the fundamental elements of biological existence are living organisms, populations, environments, and behaviour governed by genetic predispositions, so the traditional categories of the narrative – character, setting, plot – correlate with these biological elements and provide cognitive order, transcendental meaning, moral guidance, and a partial sense, however illusory, of control over one's destiny (Carroll 1995; 2004: xxii, 19, Sadowski 1999b).

Despite the fictitious nature of the narrative, characters in narratives usually do what people normally do in the real world, which from an evolutionary point of view means pursuing goals that ultimately serve two things: to survive and to reproduce. Most of the plots in literature across the world are defined by love and sex, or by a threat to the safety of the protagonist or his kin, with the universal themes of romance and heroic adventure emerging as respective outcomes of these two evolutionary goals. By the same token the two main narrative modes, comedy and tragedy, appear to reflect respectively two general types of situation crucial to human survival and propagation: situations characterized by successful adaptation, marked by survival in dangers, overcoming of obstacles, finding a mate, and happily reproducing ever after (comedy); and situations characterized by an irresolvable conflict, by failure to adapt, usually marked by a protagonist's loss of life and consequently of an opportunity to reproduce (tragedy). The two narrative modes also reflect two main types of situations involved in the relations between autonomous systems and the environment: situations marked by the satisfaction of needs and the attainment of homeostatic equilibrium, corresponding with comedy; and situations marked by an irreversible disturbance of the system's functional equilibrium, corresponding with tragedy. In between these two existential extremes are recurrent types of situations for possible narrative scenarios, as mo-

tivated by the various needs, which all derive from the evolutionary history of our species (Sadowski 1992, 1999a; 2000a). Life-simulating constructs such as verbal narrative, visual arts, drama and film thus ultimately serve an adaptive purpose, the circumstance that can firmly place the critical discussion of these constructs within the bio-epistemological paradigm postulated by the new humanities.

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