

Introduction

What is communication?

P N JOHNSON-LAIRD

In *The Expression of Emotions in Man and the Animals*, Charles Darwin wrote ‘The power of communication between the members of the same tribe by means of language has been of paramount importance in the development of man; and the force of language is much aided by the expressive movements of the face and body’ (p. 354). Darwin was right; but like most nineteenth-century thinkers he took for granted the notion of communication. It seemed to be a self-evident capacity that confers an evolutionary advantage on those species that possess it:

You see a sabre-toothed tiger.
You warn me.
I am thereby able to avoid it and to survive.
End of story.

Yet, communication is not simple. In fact, it is profoundly complicated; and the revelation of its hidden complexity is one of the great discoveries of the twentieth century.

One sure sign of this complexity is our ignorance. We still do not know, for instance, how the human auditory system recognises speech, and so we cannot build a machine that will convert speech into typewriting. (Existing devices fall far short of human ability.) We do not have a complete grammar for any natural language; we do not have a comprehensive account of how sentences convey meanings. We communicate emotions, as Darwin said, but we are still not certain what emotions are. And, when it comes to the full interplay of all the factors at work in everyday conversation, our theoreticians are hopelessly lost. Scholars in Darwin’s time did not know that they

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did not know. As modern researchers have begun to explain communication, they have rectified this second-order ignorance. But the complexity of the subject is reflected again in the need for interdisciplinary research.

The present book surveys communication from the standpoints of both the arts and the sciences. Its contributors are, in order of their appearance: a physiologist and an ethnologist, a linguist and a philosopher, a novelist and a man of the theatre (who is also a neuropsychologist), a composer and an engineer. Communication is their business or their object of study, or both, and each of them presents a coherent view of one aspect of it. None of them, however, was asked to analyse the concept of communication itself. My aim in this introduction is accordingly to provide such an analysis in order to help the reader to see how the various parts fit together into a unified picture. In short, I shall try to answer the question left unanswered by Darwin: what is communication?

Knowledge seldom advances by virtue of *a priori* definitions, and so I will proceed, not by way of definition, but by an analysis of some case histories. The first cases set the scene, and allow a line of demarcation to be drawn between communication and other sorts of causal influence. Later cases will distinguish between different varieties of communication.

The moon exerts a causal effect on the tides, but it does not, except metaphorically, communicate with them. Communication is a matter of causal influence too, but it calls for something more. In particular, a communicator has a message to transmit, whereas the moon has none. The notion of a message seems equally problematical, but the next case will help to sharpen up our intuitions about it.

When a fire ant returns to the nest from an abundant food source, other workers are able to go to the food by tracking a chemical substance – a so-called ‘pheromone’ – laid down in a trail by the returning worker. When the food runs out, workers return to the nest without laying down the trail. Other pheromones act as insect sexual attractants, alarm signals, and probably play a part in mammalian behaviour.

Sociobiologists, such as Edward O. Wilson, routinely refer to pheromones as ‘chemical communications’, and it is tempting to suppose that the fire ant has a message to communicate, namely: ‘Food!’ It may lay down its trail, however, solely as a physiological consequence of tasting food, and the behaviour of the other workers may likewise be a direct physiological consequence of their detection of the pheromone. The ants, in effect, respond to the ‘odour’ by following it; and its detection may elicit nothing apart from

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this response. Certainly, there is no need for the ant's nervous system to construct an internal representation of some rudimentary 'idea' of food that lights up in the insect's mind as soon as it smells the pheromone. Indeed, the use of a trail counts against such an internal representation: you do not need a map if you are travelling by rail. A biologist observing the ants can talk of 'chemical communication', but the ants themselves may form no internal representation of food, and their tracking behaviour may be governed by factors outside their representation of the world. Whether one still chooses to refer to the process as 'communication' is a matter of lexicographical convenience. The important point is that it lacks a component: there is no message, only a causal influence.

When a foraging bee returns to the hive, she disgorges the food she has gathered, and then performs a dance on the vertical honeycomb. The tempo of the dance, as Karl von Frisch showed, is related to the distance of the food source: the closer the food, the faster the dance. Likewise, as Patrick Bateson explains in chapter 2, the angle from the vertical to the dance's main trajectory depends on the angle from the direction of the sun to the direction of the food. The workers who attend the dancer (and who also pick up pheromonal cues) are thus able to fly almost unerringly to the source of the food.

The bee's dance conveys about the same amount of information as the ant's pheromonal trail. Yet, there is a subtle difference between the two cases. Granted that a message depends on an internal representation of a state of affairs, the dancing bee does have a message to communicate. The evidence comes from one of von Frisch's ingenious experiments. He placed a hive on one side of a mountain ridge and food on the other side, and so the bees were forced to fly a dog-leg route. When they returned to the hive, they did not perform a dance indicating the direction in which they had flown – neither their initial course nor their change of course in midflight. Instead, they danced a 'beeline' from hive to food directly through the mountain rather than around it. That they were able to work out this direction establishes that their nervous system constructs a representation of the world. This representation may encode only two dimensions because there is no sign for 'up' or 'down' in the bees' dance, and they cannot communicate the vertical location of food. Nevertheless, bees have a message; it guides their dance, and so they succeed in communicating it.

The bees' dance is symbolic. Its primary purpose is to symbolise the distance and direction of food. Like all symbolic behaviours, it is arbitrary in the following sense: quite different symbolic conventions could have been

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embodied in the dance without affecting any other facet of the bee's life. Thus, the distance of the food could have been represented by the distance traversed in the dance. The notion of an arbitrary relation between a symbol (or an element in symbolic behaviour) and what it symbolises is obvious in the case of natural language: different linguistic communities use different words for the same things. Indeed, it was the Swiss linguist and founder of structuralism, Ferdinand de Saussure, who first emphasised the arbitrary nature of the symbolic relation.

A sceptic might argue that the fire ant's trail depends equally on an arbitrary choice of pheromone: natural selection could have contrived to use a different one. But, if the detection of a pheromone controls the ant's behaviour by direct physiological means, the choice is not arbitrary. Change the pheromone, and much else besides in the ant's physiology must also be changed. The point is still clearer in another case.

When you ingest glucose, it is either used immediately as a source of energy (in the form of a substance known as ATP, adenosine triphosphate) or it is stored for future use (in the form of glycogen). Its fate depends on whether or not you need energy at the moment. One can imagine a robot that used internal symbols to represent its available energy; and the choice of the particular symbols would be arbitrary in just the Saussurian sense that concerns us. But, although a feedback system in the body controls the fate of the ingested glucose, it is not in the least symbolic. The enzymes that govern the storage or breakdown of glucose are themselves simply turned on or off by the actual amount of ATP in your body. Nothing *represents* the amount of available energy: the amount itself controls the system. If ATP were changed for some other substance, then the entire physiology of muscles would have to be changed, too. Pheromones may be similarly embedded in a physiological feedback system where their bio-chemical properties have consequences beyond their quasi-symbolic role.

The picture of communication that has so far emerged calls for the communicator to construct an internal representation of the external world, and then to carry out some symbolic behaviour that conveys the content of that representation. The recipient must first perceive the symbolic behaviour, i.e. construct its internal representation, and then from it recover a further internal representation of the state that it signifies. This final step depends on access to the arbitrary conventions governing the interpretation of the symbolic behaviour.

One complication is that communication can be a one-sided affair. When

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you smell the odour of newly baked bread, you may recognise it, and, like a fire ant, track down the bakery by following the smell. The bakery did not communicate with you, because its smell is a by-product, not a message. Nonetheless, you formed an internal representation of the bread just as though you had received a message from it. Conversely, when you soothe a fractious infant with calming words and gentle caresses, you communicate a message – one that any adult third party would easily understand – and yet its effect upon the baby may be a result of its physiological accompaniments rather than its symbolic content.

The study of animal communication is riddled with spurious cases in which what seems to be full-blooded communication turns out to be a one-sided affair. An animal appears to respond to a symbolic message but in fact has merely become conditioned to an unconscious and involuntary cue from its trainer that is correlated with the content of the message. Similarly, apparent communication *between* animals may depend on nothing more than a mutually one-sided detection of the other's response to the situation. For example, one dolphin seems to communicate to another which of two different shapes has been presented to it – with the result that both of them are rewarded with food when the second dolphin makes the appropriate response. One must be careful, however, not to read too much into this trick. It can also be performed, as Robert Boakes has shown, by pigeons. At the start of the experiment, the 'receiver' has a bias towards pecking one of two keys, which ensures that both birds receive food whenever this response happens to be correct. The 'communicator' therefore learns that one particular stimulus leads to food, and so behaves differently when it occurs. The 'receiver' then learns to make the preferred response only when the 'communicator' behaves in this anticipatory way. Ultimately, the birds may mimic the entire process of communication, and yet neither has a message to communicate. Their behaviour is not symbolic: two one-sided forms of communication have dovetailed to simulate the process.

The analysis of communication as the symbolic transmission of a mental representation applies pre-eminently to the communication of a simple propositional content – from the location of honey to a warning about a sabre-toothed tiger. It must be modified, however, for most richer forms of communication, both those that convey information about the communicator's emotional state, and those that depend on the full resources of natural language.

The life of a social mammal such as a rat (or a human being) is governed by

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emotions. They probably serve, as Keith Oatley and I have argued, a twofold communicative function. First, the perception of certain events elicits an *internal* emotional signal. This signal prepares the individual for a general course of action appropriate to the situation. It elicits a more flexible response than the fixed responses of insects; it operates more rapidly than the decoding and evaluation of complex symbolic messages. The events that trigger these signals pertain to such matters as the making of attachments, hostility towards rivals, and co-operation against predators. Second, as Darwin emphasised, the emotion spills over into the expressive behaviour of the individual, and in this way communicates itself to others by an *external* signal. The important situations in interacting with others can indeed be mapped into a small set of basic emotions that appear to be common to all social mammals (happiness–sadness, anger–fear, desire–disgust).

Emotions arise from the perception of events but their communication normally conveys, not the content of the resulting internal representation, but the individual's reaction to that content. The perception of a predator, for instance, creates fear within the individual and prepares it for fight or flight. Its alarm call communicates the emotion to other members of the group. Such cries are ritualised symbolic behaviours that may no longer serve any purpose other than to communicate the emotion. The primary content of the message is a contagious emotional state, and so the recipient is in turn infected by an emotion – the same one in a co-operative situation, and an antagonistic one in a confrontation. The external signal creates the internal signal.

Human beings can communicate in more complex ways than any other animal, and pre-eminently by using natural language. Whatever its origins, and whatever the other purposes for which it is used – for self-expression, for the externalisation of thought – it is richer than any other known symbolic system. To paraphrase George Miller, the founder of modern psycholinguistics, all human groups speak a language, and all human languages have a grammar and a lexicon. The lexicon always has words for dealing with space, time, and number, words to represent true and false, and words for communicating logical relations. The grammar contains principles governing phonology and principles governing syntax. The phonology always contains vowels and consonants, which can be described in terms of a set of features characterising the limited set of humanly possible sounds. The syntax always contains principles governing the intonation of utterances, and the hierarchical structure of phrases and sentences.

The power of language derives from three principal factors. First, the

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lexicon provides speakers with a large repertoire of individual symbols (words). Second, the grammar enables these symbols to be combined into an unlimited number of distinct symbolic messages (sentences). Third, these messages are not under the immediate control of the local environment. They can be intentionally used to refer to other states of affairs including those that are remote, hypothetical, or imaginary. Human beings can tell stories (in both senses of the word). They can give one another instructions and requests. They can do things with words.

Some chimpanzees have been taught the American sign language for the deaf, and others have been taught to manipulate symbolic shapes, and these animals have been able to ‘talk’ in a rudimentary way about their needs and about their immediate environment. Their accomplishments, however, are controversial. Whether they can master the syntactic and semantic power of a natural language are questions that have yet to be answered to everyone’s satisfaction.

In human communication, there is an intricate interplay between language and other communicative modes. When we talk to one another, we are fully engaged in the communication of content, attitude, emotion, personality. Tone of voice, for example, is an important modulator of the literal content of what we say. Once upon a time Stalin read out in public a telegram from Trotsky: ‘You were right and I was wrong. You are the true heir of Lenin. I should apologize. Trotsky.’ According to Leo Rosten, a Jewish tailor then stepped from the crowd and explained to Stalin how he ought to have read the message:

You were right and I was *wrong*? You are the true heir of Lenin? I should apologize????!

Although we all immediately recognise the ironic import of this intonation, few of us consciously know how our vocal apparatus achieves this or any other of its effects. Phoneticians and psycholinguists, of course, can tell us something of what we are doing. But, our spontaneous use of language depends on profoundly unconscious processes – not those that a psychoanalyst might hope to uncover from a patient’s free associations on a couch, but those that make our conscious experience possible. They can never enter consciousness, because they create its contents: you cannot pick up your own introspective process by its bootstraps.

The unconscious processes that enable us to speak and to understand a language operate at all levels – from the identification of individual speech

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sounds to the rapid automatic inferences that we make in order to flesh out the explicit content of utterances. These inferences are vital because the use of language is almost always dependent upon context and particularly the background assumptions that speaker and hearer share. Discourse often makes sense only if you are privy to these assumptions. On the night that Mrs Thatcher won her first election (in 1979), the former leader of the Tories, Mr Edward Heath, was interviewed on television. The key part of the interview went as follows:

Interviewer (Sir Robin Day): I think you know the question I am going to ask. What is your answer?

Heath: We'll have to wait and see.

Interviewer: Would you like to?

Heath: It all depends.

If you do not know the question that the participants (along with the country as a whole) had in mind, the exchange is a self-parody of English diffidence. The interviewer's question, 'Would you like to?' is particularly problematical because its ellipsis depends on taking the words of the question for granted. It was, of course: 'Will you serve in Mrs Thatcher's cabinet?'

Each new utterance in a conversation changes the context, and thus can play a role in the interpretation of the subsequent discourse. And context is an indispensable part of nearly all human communications. It is almost impossible outside mathematics to frame a sentence that does not depend on context and background assumptions for its interpretation. Attempts to devise 'eternal' sentences, such as:

At 2 p.m. on 12 October 1492, Christopher Columbus sighted America.

fail at once for a Martian who wants to write a postcard home, because they depend on assumptions about calendars and the measurement of time. Indeed, so dependent is interpretation on context that some philosophers and linguists have argued that no scientific theory of its role will ever be possible. Noam Chomsky remarks (in chapter 3): 'virtually any information and strategy might be relevant to determining what a presented utterance means, or what its speaker may have had in mind'.

A more pessimistic doctrine can be traced back from certain literary critics to Jacques Derrida, and ultimately to that *éminence noire* of continental philosophy, Martin Heidegger: the quest for the correct interpretation of a communication is futile. Human discourse is not the transmission of information: there is no world independent of us: the only world is the one

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that we create through our language: and so on and on, until eventually this deconstructive doctrine deconstructs itself. How, you may wonder, were you able to warn me about the sabre-toothed tiger?

In fact, people can and do communicate successfully. A speaker perceives a state of affairs, that is, constructs a mental model representing it. The speaker intends to communicate certain aspects of this situation to a listener, and so, taking into account common knowledge, utters some appropriate words. The listener perceives these words and, again taking into account common knowledge, is able to grasp the content of the speaker's immediate communicative intention. The listener constructs a mental model representing the relevant features of the original situation. A message may then pass in the opposite direction, and, as a result, the two participants may share a mutual knowledge that the act of communication has been successfully consummated. Perhaps paradoxically, the best evidence for the existence of a correct interpretation of discourse is the fact that failures of communication occur, and are known to occur. If no discourse had a true interpretation, such failures could neither occur nor be rectified. Of course, there is no end to the process of recovering speakers' intentions – why they chose to communicate this or that information. And a text does not talk back, and hence as its author's background assumptions fade into obscurity so its interpreters are free to project ever wider and ever more idiosyncratic readings onto it. But that is as much a fact about human psychology as about communication. Deconstructionism confuses the admitted difficulty of recovering the communicator's intentions with a wholly independent question: do communications ever have a correct interpretation?

Discourse about imaginary states of affairs is, as I have mentioned, a human prerogative. Although the question of what fictions mean, and what fictional referring expressions, such as 'Hamlet's mother', refer to may be philosophically problematical, understanding such discourse differs in no discernible way from understanding factual discourse. Both call for the construction of mental models of the states of affairs and events that the discourse describes. The only difference is that in one case the model purports to correspond to the world, and in the other case it does not. In one case, you may sensibly ask: 'Is that true or false?', and, as Hugh Mellor points out in chapter 4, the answer may materially influence your ability to cope with the world.

At some point in the evolution of human beings communication became an end in itself. Consider the following brief poem:

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Swiftly the years, beyond recall.
 Solemn the stillness of this spring morning.

The late Sir William Empson commented on this translation of an ancient Chinese poem:

Lacking rhyme, metre, and any overt device such as comparison, these lines are what we should normally call poetry only by virtue of their compactness; two statements are made as if they were connected, and the reader is forced to consider their relation for himself. The reason why these facts should have been selected for a poem is left for him to invent; he will invent a variety of reasons and order them in his own mind. This, I think, is the essential fact about the use of language.

A more extreme view is Paul Valéry's aphorism: 'Poetry is made from words, not ideas.' That, perhaps, is an exaggeration, but it is an antidote to the notion that genuine poetry could be composed without a concern for the words themselves. Poetry may have no significant message to communicate other than itself; and music too – particularly in the European tradition – may have no meaning beyond itself. Yet there appears to be a component common to all these 'messages': they elicit an emotional response from those individuals attuned to them. The final complication in the analysis of communication is therefore that for human beings the symbols themselves, rather than their interpretation, may come to be the important component of the message.

In this introduction, I have laid out an informal analysis of the main varieties of communication from the simplest of propositional messages to those whose significance is problematical. My aim has been to prepare the ground for the subsequent chapters, which I will now introduce.

A prerequisite for genuine communication, I have argued, is the ability to construct internal representations. This process depends itself on both physical causes and internal communications. Vision, for instance, begins with the optical process of focussing light on a light-sensitive surface, and the biochemical conversion of light into nerve impulses. These nerve impulses are the beginnings of a communicative chain within the brain. In chapter 1, Horace Barlow examines the nature of this chain, and the fate of nerve impulses emanating from cells in the retina.

An organism that constructs internal representations may be able to communicate them to others, and such a system of communication is likely to serve a purpose in the life of the organism. The nature of that purpose – the