There are a lot of stories about creatures that can talk. We usually assume that they are fantasy or fiction or that they involve birds or animals simply imitating something they have heard humans. say (as Terrence Deacon discovered was the case with the loud seal in Boston Aquarium). Yet we think that creatures are capable of communicating, certainly with other members of their own. species. Is it possible that a creature could learn to communicate with humans using language? Or does human language have properties that make it so unique that it is quite unlike any other communication system and hence unlearnable by any other creature? To answer these questions, we first look at some special properties of human language, then review a number of experiments in communication involving humans and animals. Animals and human language Communication We should first distinguish between specifically communicative signals and those which may be unintentionally informative signals. Someone listening to you may become informed about you through a number of signals that you have not intentionally sent. She may note that you have a cold (you sneezed), that you aren't at ease (you shifted around in your seat), that you are disorganized (non–matching socks) and that you are from somewhere else (you have a strange accent). However, when you use language to tell this person, I'm one of the applicants for the vacant position of senior brain surgeon at the hospital, you are normally considered to be intentionally communicating something. Similarly, the blackbird is not normally taken to be communicating anything by having black feathers, sitting on a branch and looking down at the ground, but is considered to be sending a communicative signal with the loud squawking produced when a cat appears on the scene. So, when we talk about distinctions between human language and animal communication, we are considering both in terms of their potential as a means of intentional communication. Properties of human language While we tend to think of communication as the primary function of human language, it is not a distinguishing feature. All creatures communicate in some way. However, we suspect that other creatures are not reflecting on the way they create their communi–cative messages or reviewing how they work (or not). That is, one barking dog is. probably not offering advice to another barking dog along the lines of "Hey, you should lower your bark to make it sound more menacing." They're not barking about barking. Humans are clearly able to reflect on language and its uses (e.g. "I wish he wouldn't use so many technical terms"). This is reflexivity. The property of reflexivity (or "reflexiveness") accounts for the fact that we can use language to think and talk about language itself, making it one of the distinguishing features of human language. Indeed, without this general ability, we wouldn't be able to reflect on or identify any of the other distinct properties of human language. We'll look in detail at another five of them: displacement, arbitrariness, productivity, cultural transmission and duality. Displacement When your pet cat comes home and stands at your feet calling meow, you are likely to understand this message as relating to that immediate time and place. If you ask yourcat where it has been and what it was up to, you'll probably get the same meow response. Animal communication seems to be designed exclusively for this moment, here and now. It cannot effectively be used to relate events that are far removed in time and place. When your dog says GRRR, it means GRRR, right now, because dogs don't seem to be capable of communicating GRRR, last night, over in the park. In contrast, human language users are normally capable of producing messages equivalent to GRRR, last night, over in the park, and then going on to say In fact, I'll be going back tomorrow for some more.

Humans can refer to past and future time. This property of human language is called displacement. It allows language users to talk about things and events not present in the immediate environment, Indeed, displacement allows us to talk about things and places (e.g. angels, fairies, Santa Claus, Superman, heaven, hell) whose existence we cannot even be sure of. Animal communication is generally considered to lack this property. We could look at bee communication as a small exception because it seems to have some version of displacement. For example, when a honeybee finds a source of nectar and returns to the beehive, it can perform a complex dance routine to communicate to the other bees the location of this nectar. Depending on the type of dance (round dance for nearby and tail-wagging dance, with variable tempo, for further away and how far), the other bees can work out where this newly discovered feast can be found. Doesn't this ability of the bee to indicate a location some distance away mean that bee communication has at least some degree of displacement as a feature? Yes, but it is displacement of a very limited type. It just doesn't have the range of possibilities found in human language. Certainly, the bee can direct other bees to a food source. However, it must be the most recent food source. It cannot be that delicious rose bush on the other side of town that we visited last weekend, nor can it be, as far as we know, possible future nectar in hee heaven. Arbitrariness It is generally the case that there is no "natural" connection between a linguistic form and its meaning. The connection is and from its shape, for example, determine that كلب quite arbitrary. We can't just look at the Arabic word it has a natural and obvious meaning any more than we can with its English translation form dog. The linguistic form has no natural or "iconic" relationship with that hairy four-legged barking object out in the world. This aspect of the relationship between linguistic signs and objects in the world is described as arbitrariness. Of course, you can play a game with words to make them appear to "fit" the idea or activity they indicate, as shown in these words from a child's game. However, this type of game only emphasizes the arbitrariness of the connection that normally exists between a word and its meaning.fall wall talla Figure 2.1 There are some words in language with sounds that seem to "echo" the sounds of objects or activities and hence seem to have a less arbitrary connection. English examples are cuckoo, crash, slurp, squelch or whirr. However, these onomatopoeic words are relatively rare in human language. For the majority of animal signals, there does appear to be a clear connection between the conveyed message and the signal used to convey it. This impression we have of the non-arbitrariness of animal signaling may be closely connected to the fact that, for any animal, the set of signals used in communication is finite. That is, each variety of animal communication consists of a fixed and limited set of vocal or gestural forms. Many of these forms are only used in specific situations (e.g. establishing territory) and at particular times (e.g. during the mating season). Productivity Humans are continually creating new expressions and novel utterances by manipulat- ing their linguistic resources to describe new objects and situations. This property is described as productivity (or "creativity" or "open-endedness") and essentially means that the potential number of utterances in any human language is infinite. The communication systems of other creatures are not like that. Cicadas have four signals to choose from and vervet monkeys have thirty-six vocal calls. Nor does it seem possible for creatures to produce new signals to communicate novel experiences or events. The honeybee, normally able to communicate the location of a nectar source to other bees, will fail to do so if the location is really "new."

In one experiment, a hive of bees was placed at the foot of a radio tower and a food source placed at the top. Ten bees were taken to the top, given a taste of the delicious food, and sent off to tell the rest of the hive about their find. The message was conveyed via a bee dance and the whole gang buzzed off to get the free food. They flew around in all directions, but couldn't locate the food. (It's probably one way to make bees really mad.) The problem seems to he that bee communication has a fixed set of signals for communicating location and they all relate to horizontal distance. The bee cannot manipulate its communication system to create a "new" message indicating vertical distance. According to Karl vonFrisch, who conducted the experiment, "the bees have no word for up in their language" and they can't invent one. This limiting feature of animal communication is described in terms of fixed reference. Each signal in the system is fixed as relating to a particular object or occasion. Among the vervet monkey's repertoire, there is one danger signal CHUTTER, which is used when a snake is around, and another RRAUP, used when an eagle is spotted nearby. These signals are fixed in terms of their reference and cannot be manipulated. What might count as evidence of productivity in the mon- key's communication system would be an utterance of something like CHUTT-RRAUP when a flying creature that looked like a snake came by. Despite a lot of research involving snakes suddenly appearing in the air above them (among other unusual and terrifying experiences), the vervet monkeys didn't produce a new danger signal. The human, given similar circumstances, is quite capable of creating a "new" signal, after initial surprise perhaps, by saying something never said before, as in Hey! Watch out for that flying snake! Cultural transmission While we may inherit physical features such as brown eyes and dark hair from our parents, we do not inherit their language. We acquire a language in a culture with other speakers and not from parental genes. An infant born to Korean parents in Korea, but adopted and brought up from birth by English speakers in the United States, will have physical characteristics inherited from his or her natural parents, but will inevitably speak English. A kitten, given comparable early experiences, will produce meow regardless. This process whereby a language is passed on from one generation to the next is described as cultural transmission. It is clear that humans are born with some kind of predisposition to acquire language in a general sense. However, we are not born with the ability to produce utterances in a specific language such as English. We acquire our first language as children in a culture. The general pattern in animal communication is that creatures are born with a set of specific signals that are produced instinctively. There is some evidence from studies of birds as they develop their songs that instinct has to combine with learning (or exposure) in order for the right song to be produced. If those birds spend their first seven weeks without hearing other birds, they will instinctively produce songs or calls, but those songs will be abnormal in some way. Human infants, growing up in isolation, produce no "instinctive" language. Cultural transmission of a specific lan guage is crucial in the human acquisition process.Duality Human language is organized at two levels or layers simultaneously. This property is called duality (or "double articulation"). In speech production, we have a physical level at which we can produce individual sounds, like n, b and i. As individual sounds, none of these discrete forms has any intrinsic meaning. In a particular combination such as bin, we have another level producing a meaning that is different from the meaning of the combination in nib. So, at one level, we have distinct sounds, and, at another level, we have distinct meanings. This duality of levels is, in

fact, one of the most economical features of human language because, with a limited set of discrete sounds, we are capable of producing a very large number of sound combinations (e.g. words) which are distinct in meaning. Among other creatures, each communicative signal appears to be a single fixed form that cannot be broken down into separate parts. Although your dog may be able to produce woof ("I'm happy to see you"), it does not seem to do so on the basis of a distinct level of production combining the separate elements of w+ 00+ f. If the dog was operating with the double level (i.e. duality), then we might expect to hear different combinations with different meanings, such as oowf ("I'm hungry") and foow ("I'm really bored"). Talking to animals If these properties of human language make it such a unique communication system, quite different from the communication systems of other creatures, then it would seem extremely unlikely that other creatures would be able to understand it. Some humans, however, do not behave as if this is the case. There is, after all, a lot of spoken language directed by humans to animals, apparently under the impression that the animal follows what is being said. Riders can say Whou to horses and they stop (or so it seems), we can say Heel to dogs and they will follow at heel (well, sometimes), and a variety of circus animals go Up, Down and Roll over in response to spoken commands. Should we treat these examples as evidence that non–humans can understand human language? Probably not. The standard explanation is that the animal produces a particular behavior in response to a particular sound–stimulus or noise, but does not actually "understand" what the words in the noise mean. If it seems difficult to conceive of animals understanding human language, then it appears to be even less likely that an animal would be capable of producing human language. After all, we do not generally observe animals of one species learning to produce the signals of another species. You could keep your horse in a field of cows foryears, but it still won't say moo. And, in some homes, a new baby and a puppy may arrive at the same time. Baby and puppy grow up in the same environment, hearing mostly the same things, but about two years later, the baby is making lots of human speech sounds and the puppy is not. But perhaps a puppy is a poor example. Wouldn't it be better to work with a closer relative such as a chimpanzee? Chimpanzees and language The idea of raising a chimp and a child together may seem like a nightmare, but this is basically what was done in an early attempt to teach a chimpanzee to use human language. In the 1930s, two scientists (Luella and Winthrop Kellogg) reported on their experience of raising an infant chimpanzee together with their baby son. The chim–panzee, called Gua, was reported to be able to understand about a hundred words, but did not "say" any of them. In the 1940s, a chimpanzee named Viki was reared by another scientist couple (Catherine and Keith Hayes) in their own home, exactly as if she was a human child. These foster parents spent five years attempting to get Viki to "say" English words by trying to shape her mouth as she produced sounds. Viki eventually managed to produce some words, rather poorly articulated versions of mama, papa and cup. In retrospect, this was a remarkable achievement since it has become clear that non–human primates do not actually have a physically structured vocal tract which is suitable for articulating the sounds used in speech. Apes and gorillas can, like chimpanzees, communicate with a wide range of vocal calls, but they just can't make human speech sounds. Washoe Recognizing that a chimpanzee was a poor candidate for spoken language learning, another scientist couple (Beatrix and Allen Gardner) set out to teach a female chim– panzee called Washoe to use a version of American Sign Language. As

described later in Chapter 15, this sign language has all the essential properties of human language and is learned by many congenitally deaf children as their natural first language.. From the beginning, the Gardners and their research assistants raised Washoe like a human child in a comfortable domestic environment. Sign language was always used when Washoe was around and she was encouraged to use signs, even her own incomplete "baby-versions" of the signs used by adults. In a period of three and a half years, Washoe came to use signs for more than a hundred words, ranging from airplane, baby and banana through to window, woman and you. Even more impres sive was Washoe's ability to take these forms and combine them to produce"sentences" of the type gimme tickle, more fruit and open food drink (to get someone to open the refrigerator). Some of the forms appear to have been inventions by Washoe, as in her novel sign for bib and in the combination water bird (referring to a swan), which would seem to indicate that her communication system had the potential for productivity. Washoe also demonstrated understanding of a much larger number of signs than she produced and was capable of holding rudimentary conversations, mainly in the form of question-answer sequences. A similar ability with sign language was reported by Francine Patterson working with a gorilla named Koko not long after. Sarah and Lana At the same time as Washoe was learning sign language, another chimpanzee was heing taught (by Ann and David Premack) to use a set of plastic shapes for the purpose of communicating with humans. These plastic shapes represented "words" that could be arranged in sequence to build "sentences" (Sarah preferred a vertical order). The basic approach was quite different from that of the Gardners. Sarah was systematically trained to associate these shapes with objects or actions. She remained an animal in a cage, being trained with food rewards to manipulate a set of symbols. Once she had learned to use a large number of these plastic shapes, Sarah was capable of getting an apple by selecting the correct plastic shape (a blue triangle) from a large array. Notice that this symbol is arbitrary since it would be hard to argue for any natural connection between an apple and a blue plastic triangle. Sarah was also capable of producing MARY GIVE Figure 2.2 CHOCOLATE SARAH"sentences" such as Mary give chocolate Sarah and had the impressive capacity to understand complex structures such as If Sarah put red on green, Mary give Sarah chocolate. Sarah got the chocolate. A similar training technique with another artificial language was used (by Duane Rumbaugh) to train a chimpanzee called Lana. The language she learned was called Yerkish and consisted of a set of symbols on a large keyboard linked to a computer. When Lana wanted some water, she had to press four symbols, in the correct sequence, to produce the message please machine give water. Figure 2.3 Both Sarah and Lana demonstrated an ability to use what look like word symbols and basic structures in ways that superficially resemble the use of language. There is, however, a lot of skepticism regarding these apparent linguistic skills. It has been pointed out that when Lana used the symbol for "please" she did not have to under- stand the meaning of the English word please. The symbol for "please" on the computer keyboard might simply be the equivalent of a button on a vending machine and, so the argument goes, we could learn to operate vending machines without necessarily knowing language. This is only one of the many arguments that have been presented against the idea that the use of signs and symbols by these chimpan- zees is similar to the use of language. The controversy On the basis of his work with another chimpanzee called Nim, the psychologist Herbert Terrace argued that chimpanzees

simply produce signs in response to the demands of people and tend to repeat signs those people use, yet they are treated (by naive researchers) as if they are taking part in a "conversation." As in ma