5 A blueprint in the brain?

Could any linguistic information conceivably be innate?

> There are very deep and restrictive principles that determine the nature of human language and are rooted in the specific character of the human mind.
>
> Chomsky, *Language and Mind*

> Young children must learn . . . the set of linguistic conventions used by those around them . . . for any given language . . . The human species is biologically prepared for this prodigious task . . . , but this preparation cannot be too specific, as human children must be flexible enough to learn not only all of the different words and conventional expressions of any language but also all the different types of abstract constructional patterns . . . It thus takes many years.
>
> Tomasello, *Constructing a Language*

It is relatively easy to show that humans are innately predisposed to acquire language. The hard part is finding out exactly *what* is innate. People have indulged in speculation about this for centuries. Over two thousand years ago the Egyptian king Psammetichus had a theory that if a child was isolated from human speech, the first word he spontaneously uttered would come from the world's oldest inhabitants. Naturally he hoped this would be Egyptian. He gave instructions for two newborn children to be brought up in total isolation. When eventually the children uttered the word BEKOS, Psammetichus discovered to his dismay that this was the Phrygian word for 'bread'. He reluctantly concluded that the Phrygians were more ancient than the Egyptians.

Nobody takes Psammetichus's theory seriously today – especially as the few reliable accounts we have of children brought up without human contact indicate that they were totally without speech when

they were found. The famous French boy, Victor of Aveyron, who was discovered naked rooting for acorns in the Caune woods in 1797, did not speak Phrygian or any other language. He merely grunted like an animal.

Although the speculations of Psammetichus can safely be ignored, the ideas of Noam Chomsky on the topic of innateness were for a long time taken seriously. He claimed that for language acquisition to be possible, a child must be endowed with a 'rich internal structure', and the biological evidence examined in the last two chapters suggest that his ideas cannot be summarily dismissed. Chomsky's notion of a rich innate schema contrasted strongly with the point of view popularly held earlier in the century that children are born with 'blank sheets' as far as language is concerned. Consequently, some people considered Chomsky as someone who had set out to shock the world with outrageous and novel proposals. But Chomsky denied this. He pointed out that he was following in the footsteps of eighteenth-century 'rationalist' philosophers, who believed in the existence of 'innate ideas'. Such philosophers held that 'beyond the peripheral processing mechanisms, there are innate ideas and principles of various kinds that determine the form of the acquired knowledge in what may be a rather restricted and highly organized way' (Chomsky 1965: 48). Descartes, for example, suggested that when a child sees a triangle, the imperfect triangle before his eyes immediately reminds him of a true triangle, since we already possess within us the idea of a true triangle.

But leaving philosophical predecessors aside, what exactly does (or did) Chomsky regard as innate? In his words: 'What are the initial assumptions concerning the nature of language that the child brings to language learning, and how detailed and specific is the innate scheme?' (Chomsky 1965: 27).

Chomsky gave an explicit account of his early views in his (now outdated) linguistic classic *Aspects of the Theory of Syntax* (1965), though he has repeated them in a number of other places with minor variations. But in recent years he has changed his mind on various points, sometimes quite fundamentally. His later views were set out in *Knowledge of Language: Its Nature, Origin and Use* (1986), later ones still in *The Minimalist Program* (1995) and further views in *On Nature and Language* (2002). The following account begins with his 1965 statements. It then explains why he came to regard these as unsatisfactory, and outlines his more recent ideas. It then discusses why Chomsky's ideas are gradually fading from the forefront of research, and those of later scholars, such as Michael Tomasello, are taking over.

Chomsky's early ideas: LAD and LAS

Chomsky has never regarded his proposals on the matter of innateness as definitive: 'For the present we cannot come at all close to making a hypothesis that is rich, detailed and specific enough to account for the fact of language acquisition' (1965: 27). Nevertheless, his ideas were specific enough to be interesting.

Chomsky started out with the basic assumption that anybody who acquires a language is not just learning an accumulation of random utterances but a set of 'rules' or underlying principles for forming speech patterns: 'The person who has acquired knowledge of a language has internalized a system of rules that relate sound and meaning in a particular way' (Chomsky 1972b: 26). These 'rules' enable a speaker to produce an indefinite number of novel utterances, rather than straight repetitions of old ones. As we saw in Chapters 1 and 2, an essential characteristic of language is its creativity. People do not just run through a repertoire of stereotyped phrases when they speak. Instead, they are continually producing novel utterances such as 'My baby swallowed four ladybirds', or 'Serendipity upsets me'. But where do the rules come from? How do speakers discover them? Somehow, children have to construct their own set of rules from the jumble of speech they hear going on around them. This is a formidable task. Chomsky pointed out that children are to some extent in the same situation as a linguist faced with an unknown language. Both child and linguist are surrounded by a superficially unintelligible confusion of sound which they must somehow sort out.

So let us first consider how a *linguist* deals with this unknown language situation. She possibly starts by finding simple sound sequences which refer to single objects, such as TREE, NOSE, CONGER EEL. But this stage is not particularly interesting from a syntactic point of view. Learning a few dozen vocabulary items is a relatively simple task, as is clear from the ease with which the chimps Washoe managed to do this. In addition, Genie, the Californian teenager discussed in Chapter 4, found the acquisition of vocabulary easy – it was the grammatical rules that slowed her down. For a linguist working on an exotic language, the interesting stage is likely to come when she starts to notice recurring syntactic patterns among the data. As soon as she has found some, she begins to make guesses or *hypotheses* concerning the principles which underlie the patterns. For example, suppose she repeatedly finds the utterances WOKKI SNIZZIT, WOKKI UGGIT and WOKKI SNIFFIT. She might hazard, as a first guess that the sequence WOKKI always has to be followed by a

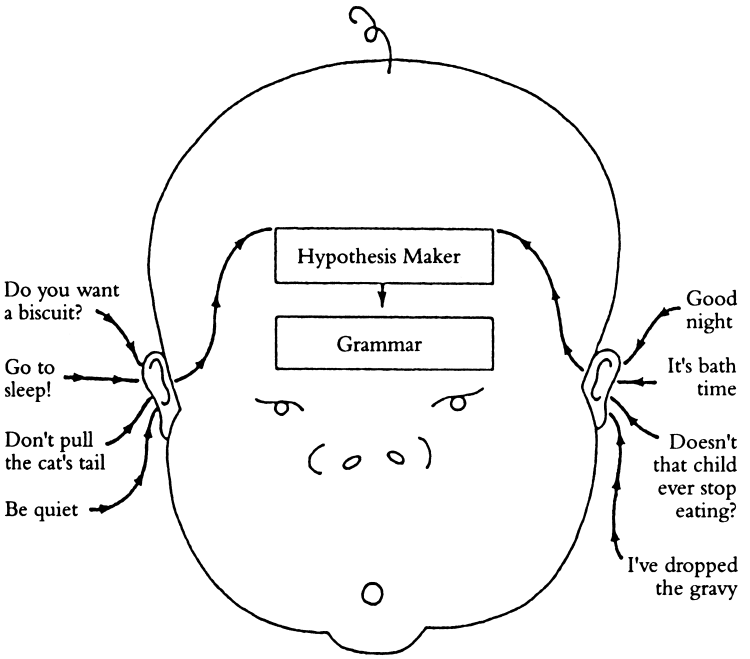
sequence which ends in -IT. But if, later, she finds utterances such as LUKKIT WOKKI and UKKING WOKKI, she would have to abandon her original, over-simple theory, and form a new, more complex hypothesis to account for the fresh data. She continues this process of forming hypotheses, testing them, then abandoning them when they prove inadequate until, ideally, she has compiled a set of rules which can account for all the possible sequences of the language she is studying.

Children, according to Chomsky (1965), construct an internalized grammar in the same way. They look for regularities in the speech they hear going on around them, then make guesses as to the rules which underlie the patterns. Their first guess will be a simple one. The second amended hypothesis will be more complex, the third, more elaborate still. Gradually their mental grammar will become more sophisticated. Eventually their internalized rules will cover all the possible utterances of the language. Fodor (1966: 109) described the situation clearly:

> Like the scientist, the child finds himself with a finite body of observations, some of which are almost certain to be unsystematic. His problem is to discover regularities in these data that, at the very least, can be relied upon to hold however much additional data is added. Characteristically the extrapolation takes the form of the construction of a theory that simultaneously marks the systematic similarities among the data at various levels of abstraction, permits the rejection of some of the observational data as unsystematic, and automatically provides a general characterization of the possible future observations.

If this hypothesis-testing view of language acquisition is correct, children must be endowed with an innate *hypothesis-making device* which enables them, like miniature scientists, to construct increasingly complex hypotheses.

However, there are a number of differences between a linguist working on an unknown language, and a child acquiring language for the first time. The linguist has always had considerably more help at his disposal. He could say to a native speaker of the language he is working on, 'Does LEGLESS DADDY-LONG-LEGS make sense?' 'Is ATE UP IT grammatical?' 'Is PLAYING CARDS ambiguous?' and so on. The child cannot do this. Yet the amazing fact remains: it is the child who acquires the complete grammar. No linguist has ever written a perfect grammar of any language. This suggests that by

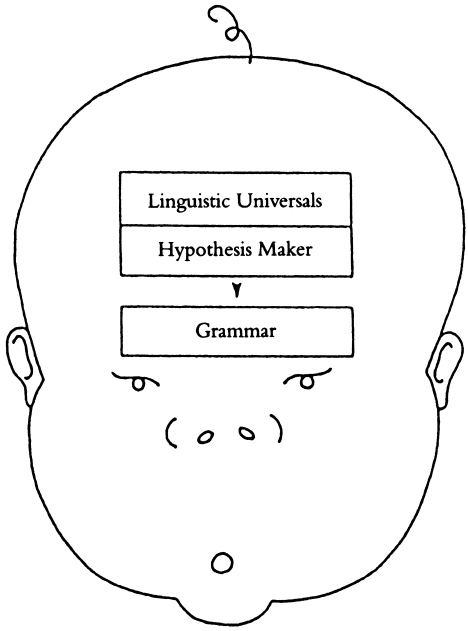


itself, an internal hypothesis-making device is not sufficient to account for the acquisition of language. The child must have some extra knowledge at his disposal. It cannot be knowledge about any particular language because babies learn all languages with equal ease. A Chinese baby brought up in England will learn English as easily as an English baby in China will learn Chinese. The wired-in knowledge must, therefore, said Chomsky, consist of *language universals*. Children learn language so fast and efficiently because they 'know' in outline what languages look like. They know what is, and what is not, a possible language. All they have to discover is *which* language they are being exposed to. In Chomsky's words, his theory:

> attributes tacit knowledge of linguistic universals to the child. It proposes that the child approaches the data with the presumption that they are drawn from a language of a certain antecedently well-defined type, his problem being to determine which of the (humanly) possible languages is that of the community in which he is placed.
>
> (Chomsky 1965: 27)

The child is perhaps like a pianist waiting to sight-read a piece of music. The pianist will know in advance that the piece will have a rhythmic beat, but she will not know whether it is in two, three or four time until she sees it. She will know that the notes are within a certain range – but she will not know in what order or combinations they come. But it is not very satisfactory to speak airily of 'innate linguistic universals'. What *are* these shadowy phenomena?

Language universals, Chomsky suggested (1965), are of two basic types, *substantive* and *formal*. Substantive universals represent the fundamental 'building blocks' of language, the substance out of which it is made, while formal universals are concerned with the form or shape of a grammar. An analogy might make this distinction clearer. If, hypothetically, Eskimos were born with an innate knowledge of igloo-building they would have *two* kinds of knowledge. On the one hand, they would know in advance that the *substance* out of which igloos are made is ice and snow, just as thrushes automatically know that their nests are made of twigs, not bricks or worms or glass. On the other hand, their innate knowledge of igloo-building would include the information that igloos are round in *shape*, not square or diamond-shaped or sausage-like, just as thrushes instinctively build round nests, not ones shaped like bathtubs.



To return to the substantive universals of human language, a child might know instinctively the possible set of sounds to be found in speech. She would automatically reject sneezes, belches, hand-clapping and foot-stamping as possible sounds, but accept B, O, G, L, and so on. She would dismiss PGPGPG as a possible word, but accept POG, PIG, PEG or PAG.

But the idea of *substantive* universals was not particularly new. For a long time linguists had assumed that all languages have nouns, verbs and sentences even though the exact definitions of these terms is in dispute. And for a long time linguists have been trying to identify a 'universal phonetic alphabet' which 'defines the set of possible signals from which signals of a particular language are drawn' (Chomsky 1972b: 121). Such a notion is not very surprising, since humans all possess similar vocal organs. More revolutionary were the *formal* universals proposed by Chomsky. These were concerned with the form or shape of a grammar, including the way in which the different parts relate to one another.

According to Chomsky, children would 'know' in advance how their internalized grammar must be organized. It must have a set of *phonological* rules for characterizing sound patterns and a set of *semantic* rules for dealing with meaning, linked by a set of *syntactic* rules dealing with word arrangement.

Furthermore, children would instinctively realize that in its rules language makes use of *structure-dependent* operations. This, as noted in Chapter 1 involves at least two types of knowledge: first, an understanding of hierarchical structure – the notion that several words can fill the same slot as one:

COWS	EAT	GRASS
LARGE BROWN COWS	HAVE EATEN UP	THE GRASS

Second, it involves a realization that each slot functions as a unit that can be moved around (though with minor extra adjustments):

3	2	1
THE GRASS	HAS BEEN EATEN	UP BY LARGE BROWN COWS

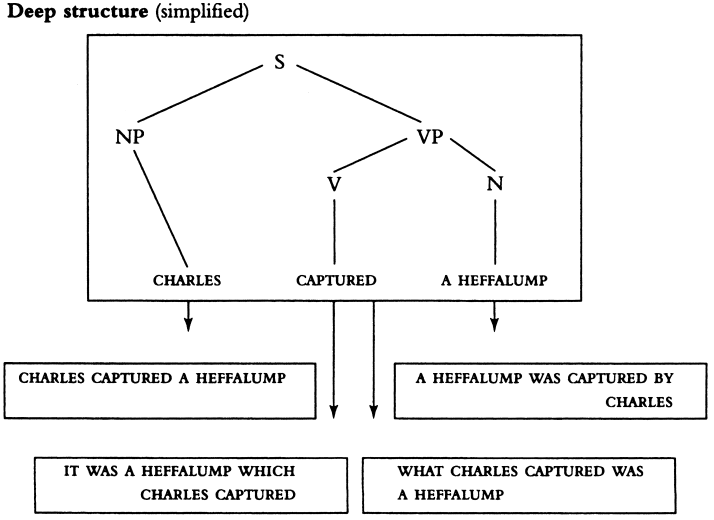
Furthermore (as outlined in Chapter 1) Chomsky at one time assumed that every sentence had an 'inner' hidden *deep structure* and an outer manifest *surface structure*. The two levels of structure were linked by rules known as *transformations*. As he explained:

> The grammar of English will generate, for each sentence, a deep structure, and will contain rules showing how this deep structure is related to a surface structure. The rules expressing the relation of deep and surface structure are called 'grammatical transformations'.
>
> (Chomsky 1972b: 166)

According to this view, several sentences that were quite different on the surface could be related to *one* deep structure. The four sentences:

CHARLES CAPTURED A HEFFALUMP.
A HEFFALUMP WAS CAPTURED BY CHARLES.
IT WAS A HEFFALUMP WHICH CHARLES CAPTURED.
WHAT CHARLES CAPTURED WAS A HEFFALUMP.

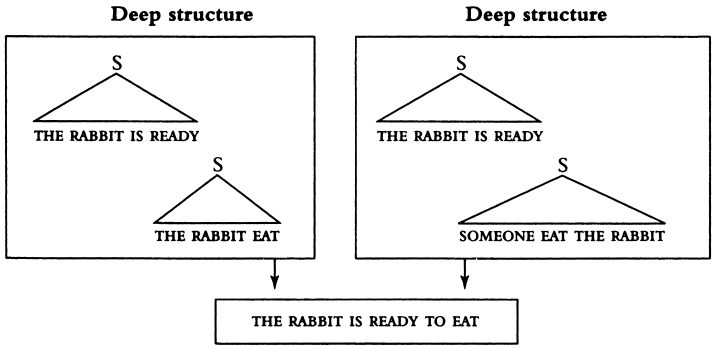
were all related to a similar underlying structure.



Alternatively, different deep structures could undergo transformations which made them similar on the surface, as in:

THE RABBIT IS READY TO EAT.

which could either mean that the rabbit was hungry, or that it was about to be eaten.



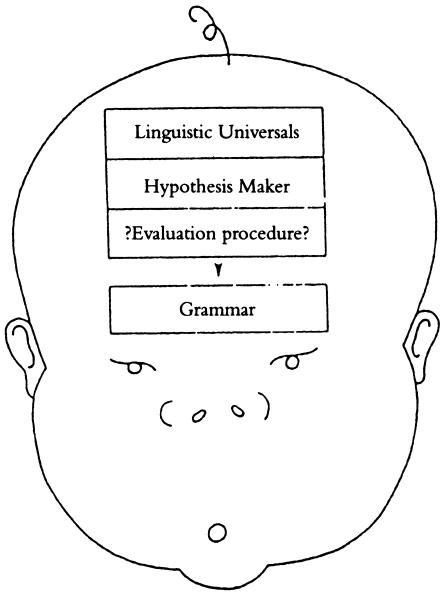
Chomsky assumed that children would somehow 'know' about deep structures, surface structures and transformations. They would realize that they had to reconstruct for themselves deep structures which were *never* visible on the surface.

To summarize so far, we have been outlining Chomsky's 'classic' (1965) viewpoint. He assumed that children were endowed with an innate hypothesis-making device, which enabled them to make increasingly complex theories about the rules which would account for the language they heard going on around them. In making these hypotheses, children were guided by an inbuilt knowledge of language universals. These provided a 'blueprint' for language, so that the child would know in outline what a possible language looked like. This involved, first, information about the 'building blocks' of language, such as the set of possible sounds. Second, it entailed information about the way in which the components of a grammar were related to one another, and restrictions on the form of the rules. In particular, Chomsky argued that children automatically knew that language involved two levels of syntax – a deep and a surface level, linked by 'transformations'. And (as he later argued) children also knew about some innately inbuilt constraints on the form sentences could take. With this help a child could speedily sift through the babble of speech he heard around him, and hypothesize plausible rules which would account for it.

Children needed to be equipped with this information, he claimed, because the 'primary linguistic data' (the data children are exposed to) was likely to be 'deficient in various respects' (1965: 201). It consisted (he controversially assumed) 'of a finite amount of information about sentences, which, furthermore, must be rather restricted in scope . . . and fairly degenerate in quality' (1965: 31).

But another problem arose. There may be more than one possible set of rules which will fit the data. How does a child choose between them? At one time, Chomsky suggested that children must in addition be equipped with an *evaluation* procedure which would allow them to choose between a number of possible grammars, that is, some kind of measure which would enable them to weigh up one grammar against another, and discard the less efficient. This was perhaps the least satisfactory of Chomsky's proposals, and many psycholinguists regarded it as wishful thinking. There were no plausible suggestions as to how this evaluation procedure might work, beyond a vague notion that a child might prefer short grammars to long ones. But even this was disputed, since it is equally possible that children have very messy, complicated grammars, which only gradually become simple and streamlined (e.g. Schlesinger 1967). So the problem of narrowing down the range of possible grammars was left unsolved.

According to Chomsky (1965 version), then, a hypothesis-making device, linguistic universals and (perhaps) an evaluation procedure constituted an innately endowed Language Acquisition Device (LAD) or Language Acquisition System (LAS), (LAD for boys and LAS for girls, as one linguist facetiously remarked). With the aid of LAD any child could learn any language with relative ease – and without such an endowment language acquisition would be impossible.



Over the years, Chomsky realized that he needed to specify further restrictions on his grammar, of which (he assumed) children were 'naturally' aware. Youngsters would know that there were constraints on the ways in which deep structures could be altered by the transformational rules. They would be automatically aware of some quite complex constraints on rearrangement possibilities. For example, consider the sentence:

IGNATIUS HAS STOLEN A PIG.

If we wanted to ask which pig was involved, we would normally bring the phrase about the pig to the front:

WHICH PIG HAS IGNATIUS STOLEN?

But supposing the original sentence had been:

ANGELA KNOWS WHO HAS STOLEN A PIG.

It would then be impossible to bring the 'pig' phrase to the front. We could not say:

*WHICH PIG ANGELA KNOWS WHO HAS STOLEN?

According to Chomsky 'some general principle of language determines which phrases can be questioned' (1980: 44), and children would somehow 'know' this.

However, this relatively straightforward system disappeared from Chomsky's later writings. What made him change his mind, and what did he propose instead?

Chomsky's later views: setting switches

Suppose children knew in advance that the world contained two hemispheres, a northern and a southern. In order to decide which they were in, they simply needed to watch water swirling down the plughole of a bath, since they were pre-wired with the information that it swirled one way in the north, and another way in the south. Once they had observed a bath plughole, then they would automatically know a whole lot of further information: an English child who discovered bathwater swirling clockwise would know that it had been placed in the northern hemisphere. It could then predict that the sun

would be in the south at the hottest part of the day, and that it would get hotter as one travelled southwards. An Australian child who noticed water rotating anticlockwise would immediately realize the opposite.

This scenario is clearly science fiction. But it is the sort of situation Chomsky then envisaged for children acquiring language. They were pre-wired with a number of possible options which language might choose. They would need to be exposed to relatively little language, merely some crucial trigger, in order to find out which route their own language had chosen. Once they had discovered this, they would automatically know, through pre-programming, a considerable amount about how languages of this type work.

Let us consider how Chomsky hit on such an apparently bizarre idea.

Learnability remained Chomsky's major concern. How is language learnable, when the crumbs and snippets of speech heard by children could not possibly (in Chomsky's view) provide sufficient clues to the final system which is acquired? There seemed no way in which the child could narrow down its guesses sufficiently to arrive at the grammar of a human language. The learnability problem has also been called the 'logical problem of language acquisition': how, logically, do children acquire language when they do not have enough information at their disposal to do so?

The logical answer is that they have an enormous amount of information pre-wired into them: the innate component must be considerably more extensive than was previously envisaged. Children, therefore, are born equipped with *Universal Grammar*, or UG for short: 'UG is a characterization of these innate, biologically determined principles, which constitute one component of the human mind – the language faculty' (Chomsky 1986: 24). This is 'a distinct system of the mind/brain' (1986: 25), separate from general intelligence.

UG was envisaged as more structured than the old and somewhat vaguer notion of innate universals. It was 'a computational system that is rich and narrowly constrained in structure and rigid in its essential operations' (1986: 43). Let us see how it differed.

Imagine an orchestra, playing a symphony. The overall effect is of a luscious tropical jungle, a forest of intertwined melodies. Yet, if one looks at the score, and contemplates the various musical instruments, one gets a surprise. Each instrument has its own limitations, such as being confined to a certain range of notes. Most of the instruments are playing a relatively simple tune. The overall, intricate Turkish carpet effect is due to the skilled interaction of numerous simple components.

In 1986, then, Chomsky viewed UG and language as something like an orchestra playing a symphony. It consisted of a number of separate components or *modules*, a term borrowed from computers. Chomsky noted: 'UG . . . has the modular structure that we regularly discover in investigation of cognitive systems' (1986: 146). Within each module, there were sets of principles. Each principle was fairly straightforward when considered in isolation. The principles became complex when they interacted with those from other modules.

The general framework was not at that time entirely new. He still retained the notion of deep and surface structure (or D-structure and S-structure as he started to call them). But the number of transformations was drastically reduced – possibly to only one! But this one, which moved structures about, was subject to very severe constraints. Innate principles specified what could or could not happen, and these were quite rigid. Chomsky's major concern, therefore, was in specifying the principles operating within each module, and showing how they interacted.

How many modules were involved, and what they all did, was never fully specified. But the general idea behind the grammar was reasonably clear. For example, one module might specify which items could be moved, and how far, as with the word WHO, which can be moved to the front of the sentence:

WHO DID SEBASTIAN SAY OSBERT BIT?

Another might contain information as to how to interpret a sentence such as:

SEBASTIAN SAID OSBERT BIT HIM INSTEAD OF HIMSELF.

This would contain principles showing why SEBASTIAN had to be linked to the word HIM, and OSBERT attached to the word HIMSELF. These two types of principles would interact in a sentence such as:

WHO DID SEBASTIAN SAY OSBERT BIT INSTEAD OF HIMSELF?

Most of the principles, and the way they interleaved, were innately specified and fairly rigid.

However, a narrowly constrained rigid UG presented another dilemma. Why are not all languages far more similar? Chomsky argued that UG was only partially 'wired-up'. There were option points within

the modules, with switches that could be set to a fixed number of positions, most probably two. Children would know in advance what the available options are. This would be pre-programmed and part of a human's genetic endowment. A child would therefore scan the data available to him or her, and on the basis of a limited amount of evidence would know which way to throw the switch. In Chomsky's words:

> We may think of UG as an intricately structured system, but one that is only partially 'wired-up'. The system is associated with a finite set of switches, each of which has a finite number of positions (perhaps two). Experience is required to set the switches. When they are set the system functions.
>
> (Chomsky 1986: 146)

Chomsky supposed that the switches must be set on the basis of quite simple evidence, and that a switch, once set in a particular direction, would have quite complex consequences throughout the language. These consequences would automatically be known by the child.

As an example, Chomsky suggested that children might know in advance that language structures have one key word, or *head*. They then had to find out the position of the subsidiary words (or *modifiers*). These could be placed either before or after the head. In English, heads are generally placed before modifiers:

Head	**Modifier**
DROP	THAT SLIPPER!
DOWN	THE DRAIN

So we get sentences such as:

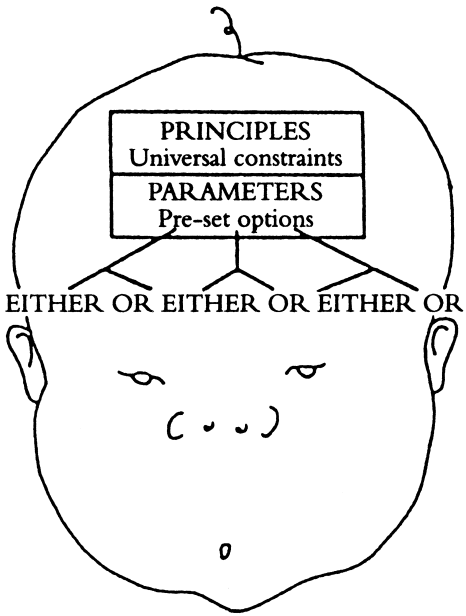
> THE DOG DROPPED THE SLIPPER DOWN THE DRAIN.

A language such as Turkish would reverse this order, and say the equivalent of THAT SLIPPER DROP, THE DRAIN DOWN. The end result is that Turkish looks quite different on the surface. It would say, as it were:

> THE DOG THE DRAIN DOWN THE SLIPPER DROPPED.

However, this superficial strangeness is to a large extent the result of one simple option, choosing to place modifiers on a different side of the head.

UG, then, was envisaged as a two-tier system: a hard-wired basic layer of universal *principles*, applicable to all languages, and a second layer which was only partially wired in. This contained a finite set of options which had to be decided between on the basis of observation. These option possibilities were known as *parameters*, and Chomsky spoke of the need 'to fix the parameters of UG' (Chomsky 1981: 4). The term *parameter* is a fairly old mathematical one, which is also used in the natural sciences. In general, it refers to a fixed property which can vary in certain ways. For example, one might talk of 'temperature' and 'air pressure' as being 'parameters' of the atmosphere. So in language, a parameter is a property of language (such as head position, discussed above) whose values could vary from language to language.



We were therefore dealing with 'a system of unifying principles that is fairly rich in deductive structure but with parameters to be fixed by experience' (Chomsky 1980: 66). The interlocking nature of

the system would ensure that minor alterations would have multiple consequences: 'In a tightly integrated theory with a fairly rich internal structure, change in a single parameter may have complex effects, with proliferating consequences in various parts of the grammar' (Chomsky 1981: 6). In particular, 'a few changes in parameters yield typologically different languages' (Chomsky 1986: 152). This whole idea has become known as the 'principles and parameters' or 'P and P' approach.

Once the values of the parameters are set, 'the whole system is operative' (Chomsky 1986: 146), and a child has acquired its *core language*. Only minor peripheral elements now remain to be learned:

> Suppose we distinguish *core language* from *periphery*, where a core language is a system determined by fixing values for the parameters of UG, and the periphery is whatever is added on in the system actually represented in the mind/brain of a speaker-hearer.
>
> (Chomsky 1986: 147)

In this system 'what we "know innately" are the principles of the various subsystems . . . and the manner of their interaction, and the parameters associated with these principles. What we learn are the values of the parameters and the elements of the periphery' (Chomsky 1986: 150).

Children had relatively little to do in this type of system: 'We view the problem of language acquisition as . . . one of fixing parameters in a largely determined system' (Chomsky 1986: 151). Indeed, many of the old rules which children had to learn just appeared automatically, because the principles underlying them were there already. Take the 'rule' that objects follow verbs, as in THROW THE BALL, EAT YOUR CAKE. The child might 'know' that languages behave consistently as far as heads and modifiers are concerned (as discussed above). Once the 'head' parameter is set, then the rule appears without any tedious learning, as does the rule that prepositions precede nouns, as in IN THE BATH, ON THE TABLE. As Chomsky noted: 'There has been a gradual shift of focus from the study of rule systems . . . to the study of systems of principles, which appear to occupy a much more central position in determining the character and variety of possible human languages' (Chomsky 1982: 7–8). If this minimal effort by the child is correct, then it makes sense to think of the language system as a 'mental organ', which grows mainly by itself, in the same way that the heart grows in the body. Chomsky became increasingly concerned to understand the principles which underlay this growth.

Paring it down still further

Chomsky tried to become like a biologist who no longer looks in turn at a human heart, then at a human elbow, but instead aims to understand the body as a whole. Or, as he suggested, he was like someone trying to go beyond the simple observation that apples fall to the ground because that is where apples inevitably end up, and instead, tries to understand the principle of gravity. In his words:

> If we are satisfied that an apple falls to the ground because that is its natural place, there will be no serious science of mechanics. The same is true if one is satisfied with traditional rules for forming questions, or with the entries in the most elaborate dictionaries, none of which come close to describing simple properties of these linguistic objects.
>
> (Chomksy 1995a: 387)

Increasingly, then, he tried to find the basic principles behind the tangled jungle of individual linguistic rules: 'The task is to show that the apparent richness and diversity of linguistic phenomena is illusory . . . the result of interaction of fixed principles under slightly varying conditions' (Chomsky 1995a: 389).

He therefore pared his proposals down to what he called a Minimalist Program, which contained hypotheses about the bare bones of language. This pared-down version retained basic switch-setting (p. 109), with its 'principles' and 'parameters', but two levels of structure were abolished. D-structure (once deep structure) and S-structure (once surface structure) no longer appeared as separate strata. The wordstore (lexicon) fed into a 'computational system', which checked that word combinations fitted in with basic principles. The wordstore also fed into a 'spell-out' which sifted through anything likely to affect the pronunciation. The endpoint was meaning on the one hand, and pronunciation on the other.

This bare-bones system remained in its preliminary stages. But the principles which guided the system were perhaps the most interesting part, though they remained sketchy. They were basically principles of 'economy' or simplicity. For example, one of these was 'Shortest Move'. If one of two chunks of structure needed to be moved, then the one which moved least far must be selected. Take the sentence:

FENELLA PERSUADED ALPHONSE TO BUY A GREEN PARROT.

Suppose you wanted to check who was persuaded, and what was bought:

FENELLA PERSUADED WHO TO BUY WHAT?

Normally, any WH-word (word beginning with WH- such as WHO, WHAT) has to be brought to the front of the sentence. But only one can be moved. So here you have to choose. Should it be WHO or WHAT? Or doesn't it matter? In fact, it matters very much. You can say:

WHO DID FENELLA PERSUADE TO BUY WHAT?

But not:

*WHAT DID FENELLA PERSUADE WHO TO BUY?

Only the WH-word nearest to the front can be moved, which ties in with Chomsky's 'Shortest Move' principle.

This, then, was the type of principle which Chomsky hoped to identify – though his goal remained elusive. As he admitted:

> Current formulation of such ideas still leaves substantial gaps. It is, furthermore, far from obvious that language should have anything like the character postulated in the minimalist program, which is just that: a research program concerned with filling the gaps and asking how positive an answer we can give to the question how 'perfect' is language?
>
> (Chomsky 1995a: 390)

But if Chomsky is so unsure, does anybody else know? Chomsky's increasingly broad and general claims about language brought him closer to people he originally disagreed with, those who argued that the broad general principles of language are indistinguishable from the broad general principles of human cognition in general. So where do we go from here?

Maybe the answer is to turn back from such huge abstract ideas, and to look again at the nitty-gritty of how humans actually use language. According to Michael Tomasello, 'how children learn language is not a logical problem but an empirical problem.' (Tomasello 2003: 328). In his opinion, we need to turn to a usage-based approach, one which explores how human children combine inherited talents

and learned skills as they acquire language. He explains: 'The human capacity for language is best seen as a conspiracy of many different cognitive, social-cognitive, information-processing, and learning skills, some of which humans share with primates and some of which are unique products of human evolution' (Tomasello 2003: 321).

The next step is perhaps to look at child language, and see what can be gleaned from the way children learn to talk. This will be the topic of the next two chapters.