

Between Chomskian Rationalism and Popperian Empiricism

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Noam Chomsky's rationalist account of the human mind has won many adherents and attracted many critics. What has been little noticed on either side of the debate is that Chomsky's rationalism is best viewed as a *pair* of quite distinct doctrines about the mental mechanisms responsible for language acquisition. One of these doctrines, the one I will call *rigid rationalism*, entails the other, which I call *anti-empiricism*, but the entailment is not mutual. Rigid rationalism is much the stronger of the two. What is more, the argument Chomsky offers for rigid rationalism is quite distinct from the argument for anti-empiricism. In the first section of this paper I will set out what I take to be the most favourable interpretation of each of these doctrines, along with the argument supporting it.

Until recently, one of Chomsky's most energetic supporters has been Geoffrey Sampson.¹ However, Sampson has now jumped ship and joined the ranks of the opposition. To make matters worse, Sampson did not leave the Chomskian camp empty handed. He absconded with the data. In an intriguing argument Sampson urges that the very data which Chomsky uses to support his rationalist theory of mind are in fact better evidence for a radically different theory of mind, an empiricist theory suggested by the work of Karl Popper and his followers.² In the second

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¹ See, for example, Sampson [1975].

² The argument is set out in Sampson [1978]. For a more detailed version of the argument, see Sampson [1980]. References in the text are to Sampson [1978].

section of this paper I will offer a critique of Sampson's argument. The burden of my critique will be that Sampson has failed to note the distinction between rigid rationalism and anti-empiricism, and that his argument at best undermines the stronger doctrine while leaving the weaker untouched. In the last few pages of this section I will turn my sights on bigger game. Once we have seen why Sampson's argument does not work against anti-empiricism, we can also see that the Popperian empiricist account of the mind is simply inadequate to the task of explaining how humans can learn language.

The arguments of the second section leave us with the conclusion that the correct theory of language acquisition must lie somewhere between Chomskian rationalism and Popperian empiricism. In the third section I will explore some of this intermediate territory. It is not my purpose to elaborate a detailed map. Rather I want to draw attention to some of the unexplored possibilities for theories which are neither empiricist nor rigid rationalist.

I CHOMSKY'S ANTI-EMPIRICISM AND CHOMSKY'S RATIONALISM

(a) *Some Assumptions about Language Learning*

At the core of the dispute between Chomsky and his empiricist critics is the question of what the mind must be like in order to account for our ability to learn language as we do. Chomsky develops his arguments for a rationalist theory against a background of assumptions about what goes on when a language is learned. What happens, according to Chomsky, is that the learner comes to have a *tacit knowledge* or an *internal representation* of the rules of a grammar. The grammar which the speaker tacitly knows is simply the grammar of the language he speaks, the very same grammar that a linguist studying the speaker's language seeks to uncover. This view of language learning is hardly uncontroversial. The critics, and I have been among them, have a pair of complaints. First, it has been argued that the relation between a speaker and the rules of his grammar is not plausibly viewed as a species of knowledge or belief.¹ Second, it has been claimed that even if a language learner does acquire tacit knowledge of a set of rules which he uses in producing and understanding his newly acquired language, it is gratuitous to suppose that these rules will be the rules the linguist uses to describe the language.² I am inclined to agree with both of these objections. But having said this, I propose to simply ignore them

¹ See, for example, Stich [1971], [1973], [1975]; Cooper [1975]; Nagel [1969]; Schwartz [1969].

² Cf. Stich [1972], [1973], [1975]. For an example of a theory of language comprehension which does not postulate an internally represented grammar, cf. Winograd [1972].

and adopt the view, shared by Chomsky and Sampson, that the end product of language learning is a tacit knowledge of the rules of the grammar. It is a concession I make not merely for argument's sake. For it now seems to me that a plausible account can be given of a notion of internal representation which does not make all internal representation a species of belief or knowledge.¹ If this can be done, the first objection has been blunted. The second assumption, that the rules a speaker internalizes are the rules of a linguist's grammar, is largely irrelevant to Chomsky's anti-empiricism. It plays a more substantive role in Chomsky's argument for rigid rationalism. But as we shall see, there is abundant reason to be sceptical about rigid rationalism even granting the assumption.

(b) *Chomsky's Anti-Empiricism*

With Chomsky, let us grant that after learning a language a speaker has tacit knowledge of the rules that a linguist would use to describe his language. What can we say about the mental mechanism that mediates the acquisition process? This mechanism can be viewed as an input-output device where the output is simply the grammar that the speaker tacitly knows. The input is rather harder to specify with precision. It consists of all those features of the learner's experience which are relevant to the language learning process. *A priori*, there is little more that can be said about the input to the language acquisition mechanism. Following Chomsky, let us give the input the label *primary linguistic data*.

Now one of the claims Chomsky has made about the language acquisition device, and to my mind the most plausible, is that the device must invoke mechanisms that are incompatible with the empiricist view of the mind. The claim is a vague one, of course, since empiricists are hardly of one mind about the mind. Still, Chomsky has argued persuasively that there are significant family resemblances, as well as significant historical links, among the views of the mind advanced by empiricist philosophers and modern learning theorists in the behaviorist tradition.² While the differences among these various theorists are considerable, there is one argument suggested by Chomsky which is telling against *any* view of language learning that would plausibly count as empiricist. In an earlier paper, I dubbed this argument *the rational scientist argument*.³

The argument can be put as follows. Suppose we set a rational scientist the task of duplicating the achievement of a language acquisition device: we provide our rational scientist with a set of primary linguistic data, and

¹ Cf. Stich [1978b].

² Chomsky has developed this theme in many places. See, for example, Chomsky [1965], [1966], [1968], [1975].

³ Stich [1978a].

she must produce the grammar that a child would come to tacitly know had the child been exposed to these data. Could the rational scientist succeed? The answer, Chomsky argues, is no. For consider the class of sentences that occur in the primary linguistic data provided. These will include (at most) all the sentences the child has ever heard along with all the sentences the child has ever himself produced. Suppose, for concreteness, that we focus on a particular child in an English speaking community, so that all the sentences in his primary linguistic data are in English. Let us call this particular class of sentences *EPLD* (for 'English primary linguistic data'). Now at the end of the acquisition process the child will tacitly know the grammar of his dialect of English, call it *GR-ENG*. This grammar will generate each of the sentences in *EPLD* and assign to each one or more phonetic, syntactic and semantic descriptions.¹ *GR-ENG* will also generate indefinitely many sentences which are not in *EPLD*, and assign each of them one or more phonetic, syntactic and semantic descriptions. The child will be able to produce many of these sentences and to understand them in accord with the semantic description provided by *GR-ENG*. However, there are indefinitely many other grammars which coincide with *GR-ENG* about the sentences in *EPLD* but diverge from *GR-ENG* for sentences outside *EPLD*. Some of these alternative grammars will not generate the same class of sentences generated by *GR-ENG*. Others, while generating the same class of sentences, will assign sentences outside *EPLD* different phonetic, syntactic or semantic descriptions. Chomsky provides a number of hints about what such alternative grammars might look like,² but the argument does not turn on the production of examples. It is a commonplace that a finite body of data can be accommodated by indefinitely many theories, and the present point is just a special case of this commonplace. Indeed, it is a particularly obvious special case since the core of a grammar is a generative system, and it is trivial to show that there are indefinitely many generative systems that will produce a given finite class of tree structures while diverging outside that class. Given the existence of indefinitely many grammars, all agreeing in what they say about *EPLD*, how is our rational scientist to choose? Some of the alternative grammars will perhaps be excludable on grounds of simplicity, there being simpler grammars that handle the same data. But it is hardly likely that an appeal to simplicity will yield a single

¹ There is a bit of idealisation here, since no doubt the primary linguistic data available to the child will contain a sampling of non-sentences of various sorts. But the idealisation favours the empiricist, not his Chomskian opponent. If the empiricist has trouble accounting for language acquisition assuming clean data, he will have still more trouble when the data are dirty.

² Cf. for example Chomsky [1975], pp. 32–33.

candidate. And, indeed, it is not clear that an appeal to simplicity, as judged by the rational scientist, will be of *any* help at all. To assume that it will is to assume that the child's language acquisition mechanism prefers a grammar which is simpler, by the scientist's lights, to one which is more complex, when both grammars agree in what they say about the data at hand. But that is an assumption for which there is neither evidence nor *a priori* argument. We conclude, then, that the rational scientist has no strategy available for selecting the grammar that the child actually acquires from the indefinitely large class of grammars which coincide with *GR-ENG* on *EPLD*, but diverge elsewhere. A bit fancifully, we can picture the choice confronting the rational scientist as in Figure 1. If we think of each point as a possible sentence, we can represent the class of sentences generated by a grammar as an oval. The scientist's chore is to project from the sentences in *EPLD* in the same way that the child's language learning mechanism does, that is, to project from *EPLD* to *GR-ENG*. Without further information, the chore would seem to be impossible to accomplish, save by accident.

To turn the rational scientist argument into an argument against empiricist theories of the mind, we need only note that the rational scientist has available to her all the theory constructing and inferential apparatus that would be attributed to the mind by any theory plausibly counted as empiricist. So if she cannot do what the child plainly can do,

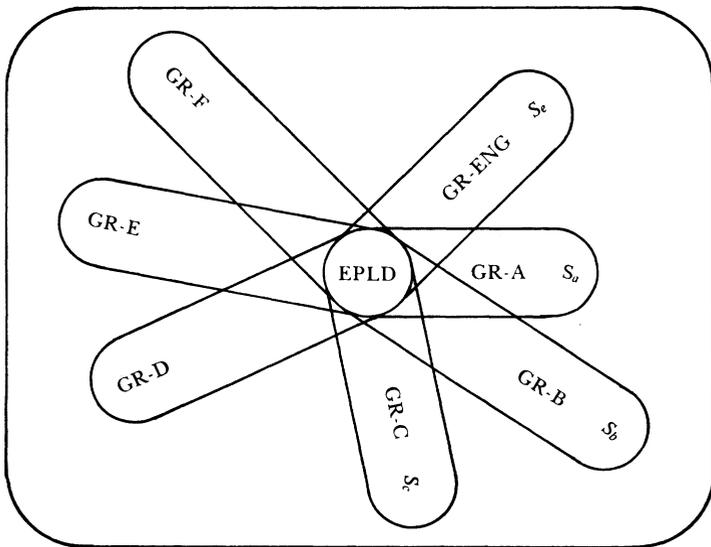


Figure 1

we can conclude that the child's mind contains some learning mechanisms that are not dreamt of in the empiricist's philosophy. Note that the rational scientist argument by itself points to no positive account of what the language acquisition mechanism is like. Its conclusion is a negative one: whatever the language acquisition mechanism is like, it cannot be restricted to the mechanisms that empiricists attribute to the mind. It is this doctrine that I call Chomsky's *anti-empiricism*. It is a doctrine that I endorse.

(c) *Chomsky's Rigid Rationalism*

In tandem with his anti-empiricism, Chomsky has long urged a positive view about the nature of the human language acquisition mechanism. The problem for an acquisition mechanism, recall, is to discover the right grammar, the one the other members of the speaker's community tacitly know, from the evidence of primary linguistic data. Mere compatibility with the data is not enough to insure the right choice, since there are indefinitely many logically possible grammars compatible with the data. But suppose the acquisition mechanism need not consider all logically possible grammars. Suppose instead that it is innately provided with a set of specifications which all human grammars must possess. Such a set of innate specifications would make the acquisition device's chore considerably easier, since it would narrow down the class of candidates it need consider. Indeed, if the specifications were restrictive enough, it might turn out that only a single allowable grammar would be compatible with each naturally occurring sample of primary linguistic data. If the specifications are not quite so restrictive, the acquisition device could still get by if it were provided with an innate ranking of grammars. It could then proceed down the ranked list of allowable grammars until it found one which was compatible with the primary linguistic data. This is the way Chomsky claims the human language acquisition device actually works. What Chomsky is urging, then, is that the language acquisition device is innately constructed so that it can output only a restricted subset of the logically possible grammars. There are certain quite specific and non-trivial features characterising all the grammars that can be output by the acquisition mechanism.¹ These features will thus be universal features exhibited by all actual grammars. Moreover, they would also be exhibited by any language that a human could learn in the normal way. As Chomsky notes, there is a strong rationalist flavour to this picture of language acquisition. The mind, or at least that part of it concerned with language

¹ There is no easy way to specify which universals are to count as 'trivial'. What I am most concerned to exclude as trivial are highly disjunctive 'universals'.

acquisition, is innately predisposed to acquire knowledge of a very special sort. Indeed, the innate predisposition is so strong that the mind cannot normally learn languages lacking the universal features. I will call this doctrine Chomsky's *rigid rationalism*.

What are the arguments Chomsky offers for his rigid rationalism? I think there are two. First, rigid rationalism is an alternative to empiricism, and as we saw Chomsky has adduced a powerful argument to show that the correct theory of language acquisition must be a non-empiricist one. Of course, the mere fact that rigid rationalism is a workable alternative to empiricist theories is a relatively weak reason for adopting it. It would be a much better reason if one thought that rigid rationalism were the *only* available alternative to discredited empiricist theories. As I have shown elsewhere, Chomsky sometimes argues as though rigid rationalism were the only available alternative to empiricism.¹ However, this is simply false; we will see in section 3 that there are many sorts of non-empiricist theories which do not follow the rigid rationalist in insisting that the grammars humans can acquire must exhibit common 'universal' features.

The second, and much the more important, argument for rigid rationalism is an empirical one. Chomsky claims that there are in fact universals to be discovered in the grammars of known human languages. There are non-trivial common features shared by the grammars of all languages that have been sufficiently studied. Granted that there are such universals, how can their existence be explained? It is Chomsky's contention that rigid rationalism provides the best explanation. If the acquisition mechanism is innately programmed so that it can output only grammars exhibiting certain features, then we would expect that these features would be present in all human grammars. Much of Chomsky's work in linguistics has been aimed at formulating and testing hypotheses about linguistic universals.²

This second argument, let us call it the *best-explanation-of-universals* argument, is susceptible to attack from two directions. First, the empirical premise that certain features are in fact universal might be challenged. The forthright approach here would be to produce counter-examples to the putative universals, examples of languages which simply do not exhibit one or another of the features Chomsky claims to be universal. For those who are not accustomed to the honest toil of seeking out counter-examples, there is a less arduous way of questioning Chomsky's empirical premise. A casual perusal of the literature of modern generative linguistics will quickly reveal that there is widespread and fundamental disagreement

¹ Cf. Stich [1978a], p. 281 and n. 10.

² Cf. for example Chomsky [1968] ch. 2, Chomsky [1972] ch. 1, Chomsky [1975] ch. 3.

about the grammars of even the most carefully studied languages. In the face of this disagreement I am inclined to think that much speculation about linguistic universals is simply premature, particularly when the putative universals are very abstract features of the organisation of a syntactic theory. We are hardly in a position to conclude that *all* grammars exhibit a wide range of abstract universal features when we have not even a single grammar whose basic features are generally agreed upon by experts in the area. Moreover, as I have argued elsewhere, claims about abstract universal features in syntax should be particularly suspect, since the grammarian's methodology has great potential for generating pseudo-universals.¹

A different strategy for attacking the best-explanation-of-universals argument is to urge a better explanation. The idea here is to grant that one or another feature does in fact appear to be universal among known languages, but to argue that there is a better explanation of this fact than the hypothesis of rigid rationalism. Both lines of attack have been used before in the literature.² However, Sampson combines them in a new and interesting way. He couples a forthright attack on some putative universals with a novel alternate explanation of the universals which resist forthright attack. It is to his argument that I now turn.

2 SAMPSON'S ARGUMENT

Sampson begins his critique by surveying a number of putative universals of phonetics, syntax and semantics, and marshalling evidence that in each case either there are known exceptions to the alleged universal features, or there is some relatively trivial and unproblematic explanation of why the feature is universal, an explanation which does not invoke rigid rationalism. Though I fancy myself an informed amateur on matters linguistic, years of close contact with professional linguists have convinced me that philosophers do well to stay out of linguists' internecine quarrels. Thus I propose to simply assume, for argument's sake, that Sampson is right about the universals he considers. My thesis will be that even granting all his linguistic contentions, Sampson has neither damaged Chomsky's anti-empiricism nor has he made Popperian empiricism even remotely plausible. But here I am getting ahead of myself.

Sampson does not claim that all alleged linguistic universals are spurious or trivially explainable. On the contrary he allows that in syntax 'Chomsky is correct in claiming that there are characteristics which appear to hold

¹ Stich [1972].

² For the first strategy, *cf.* Cooper [1975] and many references given in Sampson [1978]. For the second strategy, *cf.* Putnam [1967].

of all known human languages' (p. 188). The basic property which Sampson holds to be universal

may be summed up in the statement that natural languages are hierarchically structured. The class of grammatical sentences of any natural language can be defined by means of a finite set of context-free phrase structure rules, which ascribe grammaticality to formative strings indirectly by ascribing well-formedness to hierarchical 'phrase-markers' dominating these strings, possible supplemented by structure dependent 'transformational rules', which modify strings in ways that depend exclusively on the nature of the hierarchical phrase-markers dominating those strings (p. 188).

This universal feature of human syntax would appear to be ideal grist for the best-explanation-of-universals mill. It is a non-trivial universal for which there is no obvious explanation apart from rigid rationalism.

It is just here that Sampson makes his bold move to steal Chomsky's data. There is, Sampson claims, a better explanation of hierarchical structure than rigid rationalism. The explanation proposed relies on an argument due to Herbert Simon which shows that if a process is 'formally akin to the evolutionary process described by Darwinian theory', it is overwhelmingly likely that the systems produced by the process will have a hierarchical structure (p. 191).¹ Hence, Sampson claims,

those complex phenomena in the world which are created by processes formally akin to Darwinian evolution will as a matter of contingent fact be hierarchically structured, even if as a matter of logic they need not have been, and even if hierarchical structure makes them no fitter for survival once they have emerged than would be potentially non-hierarchical alternatives (p. 191).

To complete the argument, Sampson need only add the '*a priori* plausible' premise that 'human languages have arisen as the result of a gradual evolutionary process from simple beginnings' (p. 192). If so, then the hierarchical structure that was to serve as data for the best-explanation-of-universals argument has found an alternative explanation which is at least as plausible as rigid rationalism.

Now it might appear that if we grant a Simon-style explanation of the hierarchical structure of grammars is a possible one, then we are left with a stand-off. Both Sampson and the rigid rationalist have possible explanations, and there is as yet no way of deciding between them. But, Sampson argues, this is not the case. For there is an important fact which is accounted for only by a Simon-style explanation. This is the fact that the *only* universals that have been discovered are those which would be expected in light of Simon's argument. The rigid rationalist expects that *some* features will be universal, but he is in no position to predict what

¹ Cf. Simon [1962] for details of Simon's argument.

these features will be. For the rigid rationalist, whether or not a given feature happens to be one imposed by our innate mental structure is largely a matter of accident. For Sampson, however, there is a principled reason to expect that certain features and only those will be universal, and the data confirm this expectation (*cf.* p. 195).

We would do well to remind ourselves that there are a pair of controversial assumptions embedded in Sampson's argument. The first is that a Simon-style explanation can in fact be extended to the case of linguistic structure. The second is that, as a matter of empirical fact, the only features of human language which are universal are either hierarchical features of the sort a Simon-style explanation would have us expect, or are readily explainable without appeal to rigid rationalism. If these two assumptions can be made to stick, then Sampson will have further weakened the case for rigid rationalism. For the best-explanation-of-universals argument is the principal support for rigid rationalism. And if we grant Sampson's assumptions, there is a *better* explanation of universals. It's simple Simon.

Let us turn now to the other half of Chomsky's doctrine, his anti-empiricism, and see what implications Sampson's argument has in that quarter. Sampson boldly embraces a theory of language learning modelled on Popperian empiricism. It is his contention that Simon-style considerations can be used to defend a Popperian theory against Chomsky's anti-empiricist attack. But in this view, I will argue, Sampson is quite mistaken.

The Popperian view of learning that Sampson defends runs as follows. Learning is a gradual process in which hypotheses are formulated by the mind (possibly randomly) and then tested against experience. If a hypothesis is compatible with experience, it is retained for further testing; if it is falsified by experience, it is rejected, and the process begins again with a new hypothesis. The principal constraint on the new hypothesis is that it must be compatible with all previously acquired data.¹ As Sampson notes, this process of randomly formulating a hypothesis and then letting experience do its best to falsify it is parallel in form to Darwinian natural selection. This similarity provides the opening for Sampson to use his Simon gambit. Since a Popperian language learning mechanism is formally analogous to natural selection, we would expect the output of the mechanism to be hierarchically structured. So we need not postulate

¹ A more detailed sketch of the Popperian model for language learning is given in section 3, below. I should stress that in calling the model 'Popperian' I do not mean to suggest that Popper would endorse it. For more on this terminological point, see the last paragraph of this section.

anything more than a Popperian mind to explain the fact that a language learner ends up learning a hierarchically structured grammar. There is no need to adopt an anti-empiricist theory of learning to account for the fact that the grammars children acquire are hierarchical.

Now it is my contention that, even if we grant Sampson's claim about the sorts of grammars a Popperian mind would learn, he still has not met the challenge of Chomsky's rational scientist argument. The fault I find with Sampson's argument is simply that he explains the wrong fact. As I have set out the rational scientist argument, the crucial fact leading to Chomsky's rejection of empiricism is not that children learn a hierarchical grammar, nor even that they learn languages exhibiting the range of features Chomsky claims to be universal. Indeed, the rational scientist argument does not presuppose the existence of universals of any sort, and it works quite as well if we suppose that there are no linguistic universals. What is crucial for the rational scientist argument is that *children learn the right grammar*. That is, they learn the grammar which is tacitly known by the senior members of their linguistic community. Of course, given our Sampsonian assumptions, the right grammar will be a hierarchical grammar. But just as there will be indefinitely many logically possible grammars compatible with the child's primary linguistic data, so too there will be indefinitely many *hierarchical* grammars compatible with the child's primary linguistic data. What needs explaining is how the child's acquisition mechanism comes up with the right grammar from this indefinitely large set.

It seems clear that no theory of learning along Popperian lines can possibly provide a satisfactory explanation of the fact that the child learns the right grammar. For at each stage in the Popperian process of conjecture and refutation there are indefinitely many wrong conjectures compatible with all the data previously encountered. If the learning mechanism simply selects randomly among these, as the Popperian analogy to random mutation in natural selection would suggest, then there is no reason to expect that children would learn the right language at all, let alone that they would do it relatively quickly and at much the same pace. If the child's acquisition mechanism is Popperian, then we would expect that a few lucky children would hit on the right hypothesis early on, while the majority of children stumbled from one wrong hypothesis to another.

My critique of Sampson can be made graphically with the aid of figure 1. Suppose that *GR-ENG* along with *GR-A* to *GR-C* are a sampling of the indefinitely many hierarchical grammars compatible with *EPLD*, while *GR-D* to *GR-F* are a sampling of the indefinitely many non-hierarchical

grammars compatible with *EPLD*. At best Sampson's Simon gambit has shown that a Popperian mind would be expected to acquire a grammar of the former category. But what has not been explained, and what I maintain simply cannot be explained, is how a Popperian mind could reliably learn the right grammar, the grammar which, for example, would generate S_e rather than $S_a, S_b, S_c, \text{etc.}$

At this juncture a Popperian might well question the assumption that children do learn the right grammar. How do we know that they tacitly come to know the same grammar tacitly known by their senior co-linguists? The answer is that the child's understanding of and judgments about sentences outside his primary linguistic data match up, near enough, with the understanding and judgments of his elders. This coincidence of understanding and judgment does not, of course, entail that parent and child tacitly know exactly the same rules. Rather, what it entails is that the rules they tacitly know are equivalent in the weak sense that each set of rules generates (more or less) the same set of sentences and assigns them (more or less) the same linguistic descriptions. But even this relatively weak equivalence between the child's tacit knowledge and the tacit knowledge of his elders is a fact that a Popperian theory of learning cannot explain. For, to recur to a now familiar theme, there are indefinitely many grammars (indeed, indefinitely many hierarchical grammars) compatible with the child's primary linguistic data but not equivalent, even in the weak sense, to the grammars of his elders. The Popperian acquisition device has no way of selecting among them.

Throughout this section I have been referring to the 'Popperian' theory of mind and the 'Popperian' language acquisition device. But, as I noted earlier in a footnote, the label may well be misleading. The theory of language acquisition I have been criticising is Sampson's not Popper's, and to the best of my knowledge Popper has never addressed himself directly to the issue of language acquisition. Still, Sampson's theory is clearly modelled on Popper's theory of science as a game of conjectures and refutations. In light of the strong parallels between the two theories, we might suspect that analogues of the problems which scuttle Sampson's theory will plague Popper's account of science as well. Oddly, however, this is not the case, and it will be instructive to see why. On the Popperian account, science is the game of proposing theories, then attempting to falsify them by checking their predictions against what can be observed in nature. At any given time, the theory we should use as our working hypothesis is the strongest theory yet proposed that has not yet been falsified by nature. (This, of course, is little more than a caricature of Popper's view, but it will do for the purposes at hand.) Now suppose we

try to pursue the strategy of the rational scientist argument against Popper's view of science. To begin we note that at any given time there will be indefinitely many logically possible theories each compatible with (*i.e.* not falsified by) all the data that have been collected in a given domain. To narrow the choice, the Popperian proposes that the scientist should be guided by the strength of the hypothesis and by other methodological considerations. But now we can ask the same question we asked about the rational scientist trying to discover the right grammar: Why should we believe that these methodological directives will in fact lead us to the *right* theory, among the indefinitely many alternatives that are compatible with our data? It is just here that the analogy between language learning and the Popperian account of science breaks down. For, of course, the Popperian answer is that we don't (or at least shouldn't) believe that the theory favoured by our methodological rules is the right one, the one which truly describes nature. Quite to the contrary, accepted scientific theories are no more than working hypotheses which we expect will ultimately be falsified and replaced. Since most of the best hypotheses and theories in the history of science are demonstrably false, Popper, simply refuses to be embarrassed by the fact that the rules of his game of science may not lead to truth.¹ But things are very different when our focus is on language learning. There, as we have seen, we have good reason to believe that the learner does get the right theory, *viz.* a grammar which is at least weakly equivalent to the grammar of his elders. And any account of the learning strategy the child uses must account for this fact.

3 BETWEEN RIGID RATIONALISM AND POPPERIAN EMPIRICISM

In the previous section I argued that Sampson's Popperian mind was simply inadequate to explain the facts of language acquisition. We saw also that if we grant Sampson's various assumptions, then the already weak case for rigid rationalism collapses. It is plausible, then, to suspect that the right theory of language acquisition lies between rigid rationalism and Popperian empiricism. In this last section I want to explore some of this intermediate territory. To facilitate the exposition I will begin by sketching Sampson's Popperian language acquisition mechanism in somewhat more detail than I did previously. I will then note four rather different ways in which the Popperian mechanism might be modified.

(a) *The Sampson–Popper Language Acquisition Device*

The basic features of the Sampson–Popper device can be represented as in Figure 2. The two central components in this picture are the hypothesis

¹ For an argument that he should be embarrassed, see Lakatos [1974].

generator and the theory tester. Much of what Sampson tells us about the hypothesis generator is negative. Thus we are told that ‘the hypotheses formulated either by a child or by an adult are *not* drawn from a range (whether finitely or infinitely large) that could, even in principle, be specified in advance’ (p. 197, emphasis Sampson’s) ‘For Popper,’ Sampson writes,

‘it is a central belief that hypothesis- and concept-formulation are genuinely creative activities—not in Chomsky’s impoverished sense, according to which an activity is ‘creative’ provided the class of potential future instances is infinitely large even though definable by a finite set of rules, but rather in the everyday sense, according to which an activity is ‘creative’ only if future instances regularly fall outside any rules or norms that might be established in order to account for past instances.’ (pp. 197–8).

Once a hypothesis has been produced, the theory testing component of the mind takes over. It is the task of this component to compare the hypothesis with the data provided by experience. If the hypothesis is found to be compatible with experience it is retained and used by the language processing mechanism which mediates the production and comprehension of speech, though the testing process continues while the hypothesis is tentatively accepted and used. If, on the other hand, the hypothesis is found to be incompatible with the data of experience, the theory tester rejects it and removes it from the language processing

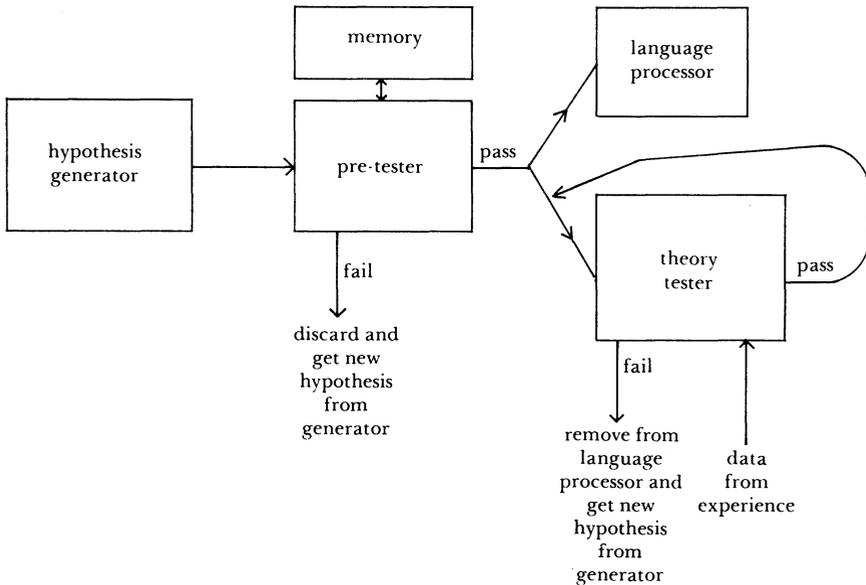


Figure 2

mechanism. When a hypothesis is falsified, the entire process starts over again; the hypothesis generator is set in motion and produces a new hypothesis which is again tentatively accepted and used while it is continuously tested against experience. Sampson several times suggests that the output of the hypothesis generator may be quite random (on the model of mutation in natural selection). If this is assumed, then a sympathetic portrait of the Popperian language learner had best add a pre-testing component which has some memory for past data and tests a new hypothesis for compatibility with this memory before passing it on to be tested against experience. Without such a pre-testing component, the system would be in danger of rejecting a falsified hypothesis, then replacing it with a new hypothesis which was incompatible with data already provided by previous experience.

Sampson tells us very little about the workings of the theory tester. In particular, he does not specify what relation must obtain between hypothesis and data for the tester to reject (or tentatively accept) the hypothesis. If we want to preserve the maximum resemblance between the language acquisition model and the orthodox Popperian account of hypothesis testing in science, then presumably the tester and the pre-tester would reject a hypothesis if and only if the hypothesis (along with other beliefs) is logically incompatible with the data of experience.

A final point to note about Sampson's Popperian Language learner is that the theory tester and the hypothesis generator are only minimally interactive. The theory tester can turn the generator on when a new hypothesis is needed, but it provides the generator with no guidance on the sort of theory to produce. The generator functions quite autonomously in deciding what theory should be offered for testing at any given time.

(b) Four Ways to Change The Sampson–Popper Model

Let us now consider some of the ways in which the Sampson–Popper model might be modified to overcome the inadequacy entailed by the rational scientist argument. Although I will discuss each modification separately, there is no reason why several of them could not be combined to produce a model of language learning that little resembles the one urged by Sampson.

(bi) Imposing Restrictions on the Hypothesis Generator

One way to modify the Popperian learning mechanism with an eye toward enabling it to learn the right grammar is to impose considerably more structure than Sampson does on the hypothesis generator. This, of course, is Chomsky's recommended strategy. Rather than viewing the hypothesis

generator as a device whose output does ‘not belong to any innately fixed range’, Chomsky proposes that the hypothesis generator might be innately constrained so that all members of its output class exhibit a range of non-trivial common features. He also suggests that there may be innate constraints on the order in which the hypothesis generator produces hypotheses, thus, in effect, imposing an innate ranking on the already restricted output class. As we have seen, however, Chomsky’s rigid rationalist theory entails the existence of non-trivial universals. And Sampson has argued that there simply are no non-trivial universals that cannot be explained more simply. In any event, there is little evidence for the existence of the broad range of abstract syntactic universals that Chomsky’s view would lead us to expect.

We should *not* conclude that the strategy of restricting the hypothesis generator is empirically untenable, however. At most what the absence of appropriate universals would demonstrate is that the hypothesis generator is not so constructed that all members of its output must share non-trivial common features. But this is only one very special way to restrict the output of the hypothesis generator. It is entirely possible to construct a hypothesis generator which can output only a tiny subset (finite or infinite) of the logically possible grammars, but a subset whose members share no common properties, save trivial ones.¹ Thus it is entirely possible that the correct language acquisition model will *not* be a rigid rationalist model but nonetheless *will* impose strong constraints on the output of the hypothesis generator.

(bii) *An Inductive Theory Tester*

A second way in which a learning model might depart from the Sampson–Popper model is in the standards of acceptability and unacceptability imposed by the theory tester (and pre-tester). Popper, notoriously, denies that there is any such thing as induction or a logic of induction. Thus in the Popperian mind a hypothesis can fail only if it (in conjunction with other tentatively accepted hypotheses) is logically incompatible with the data. But despite the premature obituaries from Popperians, inductive logic is alive and kicking.² Thus we might construct an alternative model by allowing the hypothesis tester to reject theories which are rendered implausible by the data, where implausibility is judged by the standards of one or another system of inductive logic. A more radical departure from the Sampson–Popper picture would be to have the theory tester continue to test the working hypothesis until the hypothesis reaches a

¹ Cf. Stich [1978a].

² For one such obituary, cf. Lakatos [1974], p. 162.

certain degree of confirmation, as measured by its inductive logic. When the cut-off has been reached, the acquisition system simply shuts down, and the hypothesis is subject to no further testing.

(biii) Interaction between Theory Tester and Hypothesis Generator

In both the Sampson-Popper model and the Chomskian model, the theory tester exerts little control on the hypothesis generator. This is an inefficient and implausible feature of both models. It is certainly possible to design systems in which the theory tester not only determines *that* a hypothesis is unacceptable, but also tries to analyse why. In such a system the theory tester would send messages to the hypothesis generator which would serve to direct the generator in its search for a replacement hypothesis. Of course this talk of directing a search for a replacement hypothesis makes little sense unless there is a structured space of hypotheses to be searched. Thus we could not have an interactive learning system if the hypothesis generator is the 'genuinely creative' random component conjured by Sampson. We should also note that as learning models become increasingly interactive, the distinction between the hypothesis generating component and the theory testing component begins to break down. There is no reason *a priori* to assume that these two functions can be distinguished in the mechanism that actually underlies human learning.

(b iv) A Non-Rational Theory Tester

Much recent thinking in cognitive psychology has been motivated by what might be called *the metaphor of the rational agent*. The central idea of this metaphor or conjecture is that a considerable range of mental processes might be interestingly analogous to the process whereby a rational agent infers to a hypothesis in science or in common sense reasoning. Theorists who pursue the analogy make a pair of assumptions about the mental processes under study. The first is that the process can be viewed as having an input and an output, where the input is interestingly analogous to data and the output is interestingly analogous to a hypothesis. The second assumption is that the processes mediating between input (or data) and output (or hypothesis) are rational inferential processes which are interestingly analogous to some normatively acceptable rules of inference. Both Chomsky's theory of language acquisition and the Sampson-Popper theory clearly share these assumptions. Both theories view language acquisition as inference to a hypothesis (in this case a grammar) on the basis of primary linguistic data. And both view the inference itself as a rational one. The influence of the rational agent metaphor is not restricted to theories of language acquisition. R. L.

Gregory, for example, has proposed that perception be viewed as a process of inference to a hypothesis, where the percept itself is the hypothesis, and, in the case of vision, the premises are provided by retinal stimulation.¹ The visual system, according to Gregory, attempts to produce the best hypothesis that will account for the data of visual stimulation. When the system is misled, the result is a visual illusion.²

Now what has been little noted by either cognitive psychologists or by philosophers is that the two assumptions of the rational agent metaphor are separable. Thus it is possible to have a mental process which fits the first assumption but not the second. Such a process would produce a hypothesis on the basis of perceptual (or other) data. But the processes mediating between data and hypothesis would not resemble any normatively acceptable or rational system of inference. Indeed, it might be analogous to some system of inference which would be viewed as patently irrational if applied in conscious common sense or scientific reasoning. Thus, in the case of language acquisition, we can imagine a learning mechanism which favours or disfavors a category of grammars on the basis of evidence that a rational theorist would rightly take to be irrelevant to the choice made, or even a mechanism that takes as evidence in favour of a grammar what a rational theorist would take as evidence against it. What is important about a language learning mechanism, from the point of view of natural selection, is that it should generally get the right answer; how it turns the trick is of less moment. And, as Quine has noted, language learning is 'a put-up job'.³ To get the right answer is to get the same answer that our senior co-linguists got sampling similar data. It matters little if our inferential strategies are, from a normative point of view, irrational, so long as our seniors are similarly irrational. They are, of course, since we are 'birds of a feather'.⁴

This completes my brief catalogue of modifications for the Sampson–Popper mind. I do not suggest that my catalogue is anywhere near complete. However, I hope I have said enough to establish that there is much of value to explore between Chomskian rationalism and Popperian empiricism.⁵

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¹ *Cf.*, for example, Gregory [1970], pp. 30 ff.

² For a philosophical elaboration of Gregory's theory, *cf.* Harman [1973].

³ Quine [1969], p. 125.

⁴ *Ibid.*

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