The Chomsky enigma

How is that a powerful critic of US imperialism has been regarded as a valued asset by the US military? In the first of three articles Chris Knight of the Radical Anthropology Group begins his examination of the life and work of Noam Chomsky

Noam Chomsky ranks among the leading intellectual figures of modern times. He has changed the way we think about what it means to be human, gaining a position in the history of ideas - at least according to his supporters - comparable with that of Galileo, Descartes or Newton. Since launching his intellectual assault against the academic orthodoxies of the 1950s, he has succeeded - almost single-handedly - in revolutionising linguistics and establishing it as a modern science.

Such intellectual victories, however, have come at a cost. The stage was set for the "linguistics wars"[1] when Chomsky published his first book. He might as well have thrown a bomb. "The extraordinary and traumatic impact of the publication of *Syntactic structures* by Noam Chomsky in 1957," recalls one witness, "can hardly be appreciated by one who did not live through this upheaval."[2] From that moment, the battles have continued to rage.

'Command and control'

How could a technical book on syntax have produced such dramatic effects? By his own admission, the author knew little about the world's different languages. Indeed, he outraged traditional linguists by claiming he did not need to know. Chomsky was not interested in documenting linguistic diversity. Neither did he care about the relationship between language and other aspects of human thought or life. As far as his opponents could see, he was not really interested in linguistics at all. He seemed to be more interested in computers.

In 1955, Chomsky joined the 'Research Laboratory of Electronics' at the Massachusetts Institute of Technology (MIT). His work was funded by the US military. He explains: "About half the institute's budget was coming from two major military laboratories that they administered and of the rest, the academic side, it could have been something like 90% or so from the Pentagon. Something like that. Very high. So it was a

Pentagon-based university. And I was at a military-funded lab."[3]

Chomsky clarified his activist convictions immediately on arrival. He recalls: "It was a military-financed laboratory, and people routinely went through security clearance procedures. I just refused. I know everyone thought it was kind of weird, because the only effect of it was that I missed out on free trips on military air transport and things like that."[4]

He did not get the free rides, but otherwise encountered no problems. The preface to *Syntactic structures* concludes: "This work was supported in part by the USA army (Signal Corps), the air force (Office of Scientific Research, Air Research and Development Command) and the navy (Office of Naval Research); and in part by the National Science Foundation and the Eastman Kodak Corporation."[5]

Chomsky and his supporters subsequently secured two large defence grants - one for a project based in MIT and the other for research undertaken in the University of California, Los Angeles. *Aspects of the theory of syntax* contains this acknowledgment: "The research reported in this document was made possible in part by support extended the Massachusetts Institute of Technology, Research Laboratory of Electronics, by the Joint Services Electronics Programs (US army, US navy and US air force) under contract No.DA36-039-AMC-03200(E); additional support was received from the US air force (Electronic Systems Division under contract AF19(628)-2487), the National Science Foundation (grant GP-2495), the National Institutes of Health (grant MH-04737-04) and the National Aeronautics and Space Administration (grant NsG-496)."[6]

Several questions arise. Why did Chomsky - an outspoken leftwing activist and anti-militarist - take the money? Secondly, what did the military think they were buying? Both questions are sharpened by the fact that MIT at this time had no tradition in linguistics. This confronts us with a third puzzle: why did the military not choose to invest in an institution with a proven record in this field?

Explaining his decision to choose MIT, Chomsky recalls that he felt in no mood to serve in an established department of linguistics. He needed somewhere where original thinking could be freely explored: "I had no prospects in a university that had a tradition in any field related to linguistics, whether it was anthropology or whatever, because the work that I was doing was simply not recognised as related to that field - maybe rightly. Furthermore, I didn't have real professional credentials in the field. I'm the first to admit that. And therefore I ended up in an electronics laboratory. I don't know how to handle anything more complicated than a tape recorder, and not even that, but I've been in an electronics laboratory for the last 30 years, largely because there were no vested interests there and the director, Jerome Wiesner, was willing to take a chance on some odd ideas that looked as if they might be intriguing. It was several years, in fact, before there was any public, any professional community with which I could have an interchange of ideas in what I thought of as my own field, apart from a few friends. The talks that I gave in the 1950s were usually at computer centres, psychology seminars and other groups outside of what was supposed to be my field."[7]

Chomsky was to prove fortunate in his choice of institution. Its resources attracted able students who would soon contribute to his meteoric rise.[8] The association with the military also sent out the right signal to his academic colleagues. Military folk don't subsidise leftwing propaganda. If the Pentagon was paying up despite Chomsky's well-known politics, it could only mean one thing: Chomsky's science must surely be good.

Since Chomsky himself benefited in such obvious ways, we are led to ask, what did the military stand to gain? Interviewed in 1971, colonel Edmund P Gaines explained: "The air force has an increasingly large investment in so called 'command and control' computer systems. Such systems contain information about the status of our forces and are used in planning and executing military operations. For example, defence of the continental United States against air and missile attack is possible in part because of the use of such computer systems. And, of course, such systems support our forces in Vietnam.

"The data in such systems is processed in response to questions and requests by commanders. Since the computer cannot 'understand' English, the commanders' queries must be translated into a language that the computer can deal with; such languages resemble English very little, either in their form or in the ease with which they are learned

and used. Command and control systems would be easier to use, and it would be easier to train people to use them, if this translation were not necessary. We sponsored linguistic research in order to learn how to build command and control systems that could understand English queries directly."[9]

Followers of Chomsky were by then engaged in just such a project at the University of California, Los Angeles, prompting Colonel Gaines to comment: "Of course, studies like the UCLA study are but the first step toward achieving this goal. It does seem clear, however, that the successful operation of such systems will depend on insights gained from linguistic research ..."

The colonel went on to express the air force's "satisfaction" with UCLA's work.[10]

The language machine

On the eve of the computer age, Chomsky's *Syntactic structures* excited and inspired a new generation of linguists because it chimed in with the spirit of the times. Younger scholars were becoming impatient with linguistics conceived as the accumulation of empirical facts about linguistic forms and traditions. Chomsky promised simplification by reducing language to a mechanical 'device' whose design could be precisely specified. Linguistics was no longer to be tarnished by association with 'unscientific' disciplines such as anthropology or sociology. Instead, it would be redefined as the study of a 'natural object' - the specialised module of the brain which (according to Chomsky) was responsible for linguistic computation. Excluding social factors and thereby transcending mere politics and ideology, the reconstructed discipline would at last qualify as a science akin to mathematics and physics.

In science, according to Chomsky, less is more. If a theory is sufficiently powerful and simple, it should radically reduce the amount of knowledge needed to understand the relevant facts. As he explains, "... the amount that you have to know in a field is not at all correlated with the success of the field. Maybe it's even inversely related because the more success there is, in a sense, the less you have to know. You just have to understand; you have to understand more, but maybe know less."[11]

Syntactic structures infuriated established linguists - and delighted as many iconoclasts - because its message was that much of the profession's work had been a waste of time. Why laboriously list and classify anthropological observations on the world's variegated languages if a simplifying short cut can be found? In an ice-cool, starkly logical argument that magisterially brushed aside most current linguistic theory, *Syntactic structures* evaluated some conceivable ways of constructing the ultimate 'language machine':

"Suppose we have a machine that can be in any one of a finite number of different internal states ... the machine begins in the initial state, runs through a sequence of states (producing a word with each transition), and ends in the final state. Then we call the sequence of words that has been produced a 'sentence'. Each such machine thus defines a certain language: namely the set of sentences that can be produced in this way."[12]

As his argument unfolds, Chomsky rules out his initial crude design for the envisaged machine - clearly, it would not work. By a process of elimination, he then progressively narrows the range of designs which - on purely theoretical grounds - ought to work. Thrillingly, Chomsky opens up the prospect of discovering in effect 'the philosopher's stone': the design specifications of a 'device' capable of generating grammatical sentences (and only grammatical ones), not only in English, but in any language spoken (or capable of being spoken) on earth.

Syntactic structures itself, as it happened, proved unequal to the extraordinary task. Aware of this, Chomsky in his next book proposed a completely different design for his machine - variously known as the *Aspects* model or as the standard theory.[13] Two mathematical linguists, Stanley Peters and Robert Ritchie, explored its implications - only to find that the class of grammars captured by the new model was so all-encompassing as to be vacuous. A device built in such a way, they found, would be quite extraordinarily stupid. In fact, it would be unable to distinguish between (a) any conceivable list of strings of symbols (say, all the decimal places of pi, divided into arbitrary sequences and enumerated by the value of the products of their digits) and (b) a list of actual strings used by humans for expressing themselves in, say, English. A "not too far-fetched analogy," as one critic put it, "would be a biological theory which failed to characterise the difference between raccoons and light bulbs."[14]

Chomsky proceeded as if none of this had any bearing on his work. In a pre-emptive

strike, he declared that "the gravest defect of the theory of transformational grammar is its enormous latitude and descriptive power". Constraints would have to be introduced, even if that meant complicating the originally simple and elegant design. "Notice that it is often a step forward," Chomsky observed, "… when linguistic theory becomes more complex."[15] In place of standard theory - or ST, as it was known - Chomsky now offered the extended standard theory, or EST.

By the late 1970s, however, still further changes seemed required, leading to the 'revised extended standard theory', or REST. Realising that this was still unsatisfactory, in 1981 Chomsky published his *Lectures on government and binding*, which swept away much of the apparatus of earlier transformational theories in favour of a much more complex approach.[16] In its 'principles and parameters' incarnation, the device might arguably have seemed quite encouraging to colonel Gaines:

"We can think of the initial state of the faculty of language as a fixed network connected to a switch box; the network is constituted of the principles of language, while the switches are the options to be determined by experience. When the switches are set one way, we have Swahili; when they are set another way, we have Japanese. Each possible human language is identified as a particular setting of the switches - a setting of parameters, in technical terminology. If the research programme succeeds, we should be able literally to deduce Swahili from one choice of settings, Japanese from another, and so on through the languages that humans can acquire."[17]

Without abandoning this extraordinary dream, Chomsky has since jettisoned most of the specifics in favour of an even more radical version, known as the Minimalist Programme.[18] This offers the prospect of building the device in a breathtakingly simple way. Don't re-invent the laws of nature - just make them work for you! Imagine how a snowflake grows, or how a living cell divides.

As Chomsky explains, "So, is cell division some horrible mess? Or is it a process that follows very simple physical laws and requires no genetic instructions at all because it's just how the physics works? Do things break up into spheres to satisfy least energy requirements? If that were true, it would be sort of perfect; it's a complicated biological process that's going the way it does because of fundamental physical laws. So, beautiful process."[19]

Is the creativity of language a "beautiful process" in this sense? Is it "perfect" like a snowflake? Chomsky suspects that it might be. If he is right, then assembling the language machine might be easier than we thought. Just let nature do the work! For Chomsky, the natural principle behind language is "recursion" - the embedding of one output in another of the same type.[20] Among English speakers the story of 'The house that Jack built' is often used to illustrate this principle. According to Chomsky, it is all you need. He admits that specific languages do seem to present additional complications. But anomalies should not distract us - any more than we should be led astray by accidental imperfections in a crystal. To grow a crystal, we do not have to anticipate random imperfections in advance.

This new, bare-bones approach strikes many of Chomsky's colleagues as an astonishing - and arguably refreshing - rupture in his long and remarkable career. In fact, it calls into question "almost everything" Chomsky has previously claimed: "My own view is that almost everything is subject to question, especially if you look at it from a minimalist perspective ... So, if you had asked me 10 years ago, I would have said government is a unifying concept, X-bar theory is a unifying concept, the head parameter is an obvious parameter, ECP, etc, but now none of these looks obvious. X-bar theory, I think, is probably wrong, government maybe does not exist."[21]

Even the concept of "deep structure" has now vanished altogether. To appreciate what this means, imagine Newton abandoning 'gravity' or Marx abandoning 'class'. As Chomsky demolishes the fundamentals of his former paradigm, it is difficult to discern quite what remains. But then how precisely is the language device to be built? Is the underlying idea - the principle of recursion - enough in itself? The US military has long since abandoned all hope of a workable machine.

Linguistics as physics

To his academic colleagues in the humanities and social sciences, Chomsky's programme has caused predictable astonishment, exasperation and even outrage. How could Chomsky imagine it possible - even in principle - to construct a 'device' enabling scientists to 'deduce' the languages currently or historically spoken across the world?

In replying to such critics, Chomsky accuses them of not understanding science. To do science, he explains, "you must abstract some object of study, you must eliminate those factors which are not pertinent ..."[22] The linguist - according to Chomsky - cannot study humans articulating their thoughts under concrete social or historical conditions. Instead, you must replace reality with an abstract model. "Linguistic theory," Chomsky declared in 1965, "is concerned primarily with an ideal speaker-listener, in a completely homogeneous speech-community, who knows its language perfectly and is unaffected by such grammatically irrelevant conditions as memory limitations, distractions, shifts of attention and interest, and errors (random or characteristic) in applying his knowledge of the language in actual performance."[23]

In an implicit reference to the great Swiss theoretician, Ferdinand de Saussure, he invokes the authority of "the founders of modern general linguistics" in support of this position, adding that "no cogent reason for modifying it has been offered."[24]

Chomsky's decision, then, is to work with a deliberately simplified model. In applying this, he envisages children acquiring language not through successive stages, but in an instant. The evolutionary emergence of language is also conceptualised as an instantaneous event.[25] Lexical concepts (the literal meanings of words) are for Chomsky not historically determined: they were genetically installed when our species evolved. But what about modern concepts such as, say, 'carburettor' or 'bureaucrat'? Did our distant Stone Age ancestors already have such concepts in their heads? Chomsky thinks they must have done.

After defending this bizarre idea in a general way, he elaborates: "Furthermore, there is good reason to suppose that the argument is at least in substantial measure correct even for such words as 'carburettor' and 'bureaucrat', which, in fact, pose the familiar problem of poverty of stimulus if we attend carefully to the enormous gap between what we know and the evidence on the basis of which we know it. The same is often true of technical terms of science and mathematics, and it surely appears to be the case for the terms of ordinary discourse. However surprising the conclusion may be that nature has provided us with an innate stock of concepts, and that the child's task is to discover their labels, the empirical facts appear to leave open few other possibilities."[26]

'Thus Aristotle had the concept of an airplane in his brain, and also the concept of a bicycle - he just never had occasion to use them!" comments the philosopher, Dan Dennett, adding that he and his colleagues find it hard not to burst out laughing at this point.[27] Chomsky is here defending a strong form of the so-called 'modular mind' hypothesis, initially inspired by his own theory of an innate 'language device'. Humans, according to this view, speak not for social reasons, but in expressing their individual genetic nature, speech being the autonomous output of a specialised computational mechanism - the 'language organ' - genetically 'installed' (Chomsky's term) in the brain of every child on earth.

In his capacity as a natural scientist, Chomsky sees people as "natural objects", their language a "part of nature", while linguistics as a discipline "falls naturally within human biology".[28] However, this is not biology as normally understood. Discussing how language may have evolved, Chomsky suggests: "The answers may well lie not so much in the theory of natural selection as in molecular biology, in the study of what kinds of physical systems can develop under the conditions of life on earth ..."[29]

The apparently complicated features of grammar may be "simply emergent physical properties of a brain that reaches a certain level of complexity under the specific conditions of human evolution".[30] In an echo of the Manhattan project, Chomsky offers is own version of what might be termed the cognitive meltdown theory: "We know very little about what happens when 10^{10} neurons are crammed into something the size of a basketball, with further conditions imposed by the specific manner in which this system developed over time. It would be a serious error to suppose that all properties, or the interesting properties of the structures that evolved, can be 'explained' by natural selection."[31]

But Chomsky has proposed a variety of scenarios. He appears equally happy with the speculation that "... a mutation took place in the genetic instructions for the brain, which was then reorganised in accord with the laws of physics and chemistry to install a faculty of language".[32] As if willing to try anything, he has recently suggested that language's recursive structure may have emerged as a spandrel - an accidental by-product - of unspecified other developments connected with, say, navigation or mind-reading.[33]

For Chomsky, linguistics can aspire to the precision of physics because language itself is a "natural object". As such, it approximates to a "perfect system". Biologists, according to Chomsky, do not expect perfection, which is a distinctive hallmark of physics. He explains: "In the study of the inorganic world, for mysterious reasons, it has been a valuable heuristic

to assume that things are very elegant and beautiful."[34] If it is to succeed in connecting sounds with meanings, language must solve a number of technical problems. In an apparent nod toward creationism or 'intelligent design', Chomsky continues:

"If a divine architect were faced with the problem of designing something to satisfy these conditions, would actual human language be one of the candidates, or close to it? Recent work suggests that language is surprisingly 'perfect' in this sense ... Insofar as that is true, language seems unlike other objects of the biological world, which are typically a rather messy solution to some class of problems, given the physical constraints and the materials that history and accident have made available."[35]

Language, according to Chomsky, cannot just have evolved. It lacks the untidiness we would expect of an accumulation of accidents made good by evolutionary 'tinkering'. Characterised by beauty bordering on perfection, it cannot have arisen in the normal Darwinian way.

Who benefits?

It is perhaps easy to understand why computer engineers might find it useful to treat language as a mechanical 'device'. If, say, the aim were to construct an electronic command-and-control system for military use, then traditional linguistics would clearly be inadequate. The requirement would be for a version of language stripped free of meanings in any human or cultural sense - stripped of metaphor, poetry, humour, politics or anything else not accessible to a machine.

But military figures such as colonel Gaines were not the only people who in the 1960s hoped to benefit from the new approach. What of Chomsky's other institutional sources of support? And what about his own fiercely anti-militarist politics? How did an anti-capitalist revolution connect with the 'revolution' Chomsky was inaugurating within linguistics? Indeed, can the two sides of Chomsky's output be reconciled at all? Was the young anarchist tailoring his theories to meet the requirements of his military sponsors - forcing us, perhaps, to question the sincerity of his anarcho-syndicalist commitments? Or did he believe he was taking the money - refusing to let this influence his scientific results - in order to secure the best possible position from which to promote the anarchist cause?

Notes

1. RA Harris *The linguistics wars* New York 1993.

2. H Maclay, 'Linguistics: overview', in D Steinberg and L Jakobovits (eds) *Semantics* Cambridge 1971, p163.

3. N Chomsky *Class warfare* (interviews with David Barsamian), London 1996, p102.

4. *Op cit* p98.

5. N Chomsky *Syntactic structures* The Hague 1957, p1.

6. N Chomsky *Aspects of the theory of syntax* Cambridge, Mass 1965, piv.

7. Interview in J Peck (ed) *The Chomsky reader* London 1988, pp15-16.

8. See FJ Newmeyer *The politics of linguistics* Chicago 1986, p84.

9. *Ibid* pp85-86. This source of funding was initially very helpful to Chomsky, but dried up completely in the late 1960s. Had the military been expecting from Chomsky a real 'command and control' machine, they would have been disappointed - he could not deliver anything workable and anyway was not interested. What corporate America got from Chomsky were long-term institutional gains in terms of how science was defined, not devices which could be manufactured or patented.

10. *Ibid*.

11. Interview in J Peck (ed) *The Chomsky reader* London 1988, p17.

12. N Chomsky *Syntactic structures* The Hague 1957, p18.

13. N Chomsky *Aspects of the theory of syntax* Cambridge, Mass 1965.

14. E Bach, 'Explanatory inadequacy', in D Cohen (ed) *Explaining linguistic phenomena* New York 1974, p158. See also S Peters and R Ritchie, 'On restricting the base component of transformational grammar *Information and Control* 18: 493-501, 1971; S Peters and R Ritchie, 'On the generative power of transformational grammars' *Information Sciences* 6: 49-83, 1973; S Peters and R Ritchie, 'Non-filtering and local-filtering transformational grammars', in J Hintikka *et al* (eds) *Approaches to natural language* Dordrecht 1973, pp180-94.

15. N Chomsky *Studies on semantics in generative grammar* The Hague 1972, pp125-26. Since Chomsky denies the relevance of Peters-Ritchie, it is worth quoting Frederick Newmeyer, then a strong supporter of Chomsky: "The Peters-Ritchie findings," he writes, "served as silent witness to almost all of the significant work in syntax in the 1970s. There was hardly a paper written that did not appeal to the increased restrictiveness of the theory that followed as a consequence of the adoption of the [Peters-Ritchie] proposals ... Constraint after constraint was put forward to limit the power of the grammar" (FJ Newmeyer *Linguistic theory in America* New York 1980, p176). For discussion, see RA Harris *The linguistics wars* New York 1993, p293n.

16. N Chomsky *Lectures on government and binding* Dordrecht 1981.

17. N Chomsky *New horizons in the study of language and mind* Cambridge 2000, p8.

18. Outlined in N Chomsky *The minimalist programme* Cambridge, Mass 1995.

19. N Chomsky *On nature and language* Cambridge 2002, p103.

20. MD Hauser, N Chomsky and W Tecumseh Fitch, 'The faculty of language: what is it, who has it, and how did it evolve?' *Science* 298, 1569-1579, 2002.

21. N Chomsky *On nature and language* Cambridge 2002, p151.

22. N Chomsky *Language and responsibility* (interviews with Mitsou Ronat), New York 1979, p57.

23. N Chomsky *Aspects of the theory of syntax* Cambridge, Mass 1965, pp3-4.

24. Ibid.

25. N Chomsky *On nature and language* Cambridge 2002, p148.

26. N Chomsky *New horizons in the study of language and mind* Cambridge 2000, pp64-66.

27. D Dennett *Consciousness explained* London 1991, pp192-93n.

28. N Chomsky *Reflections of language* London 1976, pp186, 123.

29. N Chomsky *Language and problems of knowledge* Cambridge, Mass 1988, p167.

30. N Chomsky, 'Linguistics and cognitive science: problems and mysteries', in A Kasher (ed) *The Chomskyan turn: generative linguistics, philosophy, mathematics and psychology* Oxford 1991, p50.

31. N Chomsky *Reflections on language* London 1976, p59.

32. N Chomsky 'Language and mind: current thoughts on ancient problems' *Pesquisa Linguistica* 3, 4, 1998, p17.

33. MD Hauser, N Chomsky and W Tecumseh Fitch, 'The faculty of language: what is it, who has it, and how did it evolve? *Science* 298, 1569-1579, 2002.

34. N Chomsky *New horizons in the study of language and mind* Cambridge 2000, pp106-33.

35. N Chomsky *Powers and prospects: reflections on human nature and the social order* London 1996, p30.