The M.A.K. Halliday Library Functional Linguistics Series

M.A.K. Halliday
Edited by Jonathan J. Webster

Aspects of Language and Learning

Springer

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About the Series

The M.A.K. Halliday Library Functional Linguistics Series focuses on studies concerning the theory and application of Systemic Functional Linguistics (SFL). As a functional theory of language, SFL was initially developed by Professor M.A.K. Halliday and his colleagues in London during the 1960s, and since then its influence has spread all over the world.

Systemic Functional Linguistics distinguishes itself as a functional theory by the emphasis placed on system in relation to structure. It has also been particularly concerned with modelling language in context. The theory is especially wellknown for the work on discourse analysis, cohesion, genre and register, appraisal and so on, which have been taken up by scholars working in other fields.

Since Halliday's early work on Chinese and English, systemic functional linguists around the world have been increasing the coverage of the description of different languages over the decades, including French, Spanish, Portuguese, German, Danish, Finnish, Persian, Thai, Vietnamese, Japanese, Korean, Tagalog, Bahasa Indonesian, Gooniyandi and others.

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Preface

This publication is based on a series of lectures given at the National University of Singapore in the year 1986. I was preparing them for publication at that time, but for personal reasons, I was unable to complete the task, and they were stowed away and, as I thought, no longer recoverable. However, it turned out that the original and one photocopy had been preserved, the one by Jonathan Webster, who has done so much work as editor, and as a personal friend, to make my writings accessible, and the other by my friend and colleague David Butt, who simply decided that he was not going to throw them away.

Then at some moment, two other friends of mine, Huang Guowen and Chang Chenguang, co-editors of the Springer "M.A.K. Halliday Library Functional Linguistics" Series, came to hear about these lectures and suggested that they might be published as one of the volumes in this series. Jonathan Webster then had them transcribed, by his assistant Peggy Tse, and had the texts checked and all the figures redrawn.

I was pleased to have these lectures brought back to life, and I am extremely grateful to all those people who made it happen. But the problem was how should I revise them? Any extensive revision, with updating of bibliography, would have been impossible; it would have meant writing an entirely new book (which was what I had started to do at that time but never finished). Now, I no longer have the energy, and in any case, I do not know anything of the more recent work that has been done on many of the topics that I touched upon, so there was no possibility of bringing it up to date. So I decided to leave the text just as it was, as my way of introducing a framework of knowledge about language, and ideas about language and learning, to an unknown audience, well versed in English, at a world-class Asian university.

For the same considerations, I have left the text closely linked to its Singaporean context, because that is the context for which it was conceived and in which it was originally presented in spoken form. I had paid several working visits to Singapore and had Singapore listeners in mind; I have not attempted to change this, or to disguise it.

Now, almost thirty years later, it is being recontextualized, in a world with different technology, a different socio-economic order, and different problems and challenges. In its written form, the discourse may seem remote, perhaps somewhat quaint. But I hope it may still be relevant, at least to someone who may be trying to interest an informed and educated audience, not specializing in linguistics, in that most fascinating of all areas of human activity and human knowledge—language.

Guangzhou M.A.K. Halliday
May 2015

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Chapter 1
Language, Learning and 'Educational Knowledge'

In these lectures, I plan to roam around a fairly broad terrain. First, I will spend some time venturing into history, in various senses of the word 'history', beginning with the life history of the human child and his experiences as a baby before we might think he has any language at all. Next, I will look at the history of the language that we use in order to encode our knowledge, particularly our scientific knowledge—the history of scientific English, in other words. Then, putting these two together, I shall ask how a growing child comes to master this kind of language and put it to his own use as a means of learning. After that, I shall explore one or two questions of the relationship among language, education and culture, again taking the language of science as the focal point for the discussion, and finally, I shall try to draw these various themes together to construct a sort of language-based picture of experience—a linguistic interpretation of how we learn and how we learn how to learn. In all of this discussion, I am deliberately putting language at the centre of the stage. It is hard for any of us to keep language in the focus of attention for very long: we tend to fly off from it in all directions, to study thought processes, behaviour patterns, aesthetic values and so on. But I shall try to resist this tendency and shall ask you to **think linguistically**, that is, to use your conscious and unconscious understanding of language as a means of thinking about the world, and in particular—since this is my unifying concern in these lectures—to use language as a tool for exploring how people learn. The more deeply we understand the processes of learning, the more likely it becomes that we shall be able to help people to learn more effectively.

So in bringing together the concept of 'language' and the concept of 'learning', I am not focusing exclusively on questions to do with learning language, whether mother tongue, first language, second language or any others. Learning language is obviously an essential part of the picture; but I want to see it as part of a broader conception in which learning—all learning—is itself linguistic activity. Whatever you learn, you are engaged in language; learning involves 'languaging', if you will allow me this license with English (we have no word for the general process that lies behind the traditional four skills). But learning is always learning **something**, and since I cannot range over the whole terrain of human knowledge, I shall use scientific learning as a kind of focus for the general discussion. Insofar as I shall be considering language in the context of education, and of educational knowledge,

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I shall use scientific discourse as the principal domain in which to explore and from which to draw my illustrations.

But first we should start at the beginning—or one of the beginnings. In fact, there are two beginnings to language and learning: one is in the origins of the human species, the phylogenetic beginnings, but these unfortunately we cannot observe. We cannot go back in time to observe how language evolved in the early history of the human race. The other is the birth of a human child, the ontogenetic beginnings, and since these can be and have been observed, I would like to take this as the starting topic of this lecture. The question I want to address is: if we take a **linguistic** view of learning, how does this process start? And how then does it evolve into a special kind of learning process that we refer to as 'education'?

Until fairly recently, it was customary to think that a child has no language until he starts to say things in his mother tongue, some time on in the second year of his life. It always struck me as surprising that people would continue to hold this view when the evidence seemed so very clear that children are communicating from birth. They are born as communicating beings, and even if they do not begin to speak in English, or in Chinese, or in any other one of our adult languages till they are 12–15 months of age or more, they are typically responding to language almost from the day they are born and *using* language to communicate with from somewhere around 6–9 months of age. What they use first, however, is not our adult language, but rather a little language they create for themselves: we could refer it as a child tongue, not a mother tongue. But they cannot create it **by** themselves; no one could, because all 'languaging' is interactive, and this child tongue, or 'protolanguage', is created by a child together with those around him—mother, father, older brothers, sisters, etc.—when they listen to the child and understand what he is saying. The adults conduct their part of the dialogue in their own adult language; perhaps a little bit simplified although not necessarily so. Now, the point I want to establish first of all is that this protolanguage, as exchanged between the child and those who share in his acts of meaning, is already a highly effective medium of learning. Let me give you some examples from my own observations of Nigel, when he was aged 9–14 months, to show how he was already using his language to make sense of the world—to build up a picture out of his small but growing body of experience.

Text 1.1: Nigel at nine months—using language to learn

Nigel had just learnt to sit up on his own, and was now ready to start meaning in earnest.

He had a little floppy rabbit; I was holding it on my hand and stroking it, then making it jump in the air. When I stopped, Nigel put out his hand, and touched the rabbit, firmly but without pushing it. It was a gesture which meant 'go on, do that again'—the same meaning that he has later to express vocally as "ùh".

He had two other gestures. If he meant that he wanted something, he would grasp it firmly in his fist, without pulling it towards him, and then let go. If he meant he did not want it, he would touch it very lightly and momentarily with the tip of his finger.

These gestures were true acts of meaning. Nigel was not acting directly on the objects; he was addressing the other person, enjoining him to act.

In addition to the three meanings conveyed by gesture, Nigel had two other meanings which he expressed vocally. The two expressions were almost the same: one was "èu", the

other, slightly higher pitched at its starting point, was "èu". The first meant 'let's be together', and was used in conversation: "Nigel!"—"èu"—"*There's* a woozy woozy woozy"—"èu", and so on ad inf. The other meant 'look—a commotion', and was the successor to " ' ", the tiny high-pitched squeak. Nigel used it to express interest in his surroundings, especially that part of the surroundings that went into violent movement, like a flock of birds taking off.

This was the opening scene of Nigel's language.

These were two, out of a little set of ten or twelve 'signs'—sounds, or gestures—used regularly, systematically, and in a meaningful way.

Now, this is not yet a kind of English; Nigel is not yet trying to learn English, and you could not tell from **his** contributions to the dialogue what his mother tongue is going to be. (Some children do use more sound imitations at this stage, but that is just a difference of strategy; Nigel on the other hand invented his own sounds and in fact used some sounds that do not occur in English at all.) When my Chinese colleague Qiu Shijin studied the early language development of children growing up in Shanghai, she found the same pattern: first a protolanguage which did not necessarily sound like a form of Chinese at all and then, from around the middle of the second year, the move into the mother tongue, in this case Shanghainese (Qiu 1985). But with the Chinese children, as with the English children, she found that the protolanguage was being used in very much the same range of meanings: it was what they too were constructing as a tool with which to learn.

But you may well want to ask: learning what? You may doubt that what is taking place is in any real sense learning at all. I think it is, and I think we can be rather precise about what it is that is being learnt. This is brought out by my own observations, by Qiu Shijin, and again by my colleague Clare Painter in her detailed study of her first child, Hal (Painter 1984). Consider now some further examples from Nigel.

Text 1.2(a): Nigel at ten and a half months

Ten and a half months

Nigel was sitting on my knee. On the table in front of us was a fruit bowl with an orange in it. Nigel struggled to reach it.

"nà nà nà nà," he said. It meant 'I want it', 'give it to me'.

I gave him the orange. He made it roll on the table; it fell off.

"nà nà nà nà," he said again.

When the game was over, he got down, crawled away and disappeared along the passage, going boomp-boomp-boomp as he went. Then silence. His mother began to wonder where he was.

"Nigel!" She called.

"è—e—eh" It was his special response to a call: 'Here I am'.

"Where is he?" said his mother. "Nigel!"

She went to look for him. He was standing, precariously, by the divan, looking at his picture cards that were hanging on the wall.

"dòh," he said as she came in. It meant 'hullo—shall we look at these pictures together? "dòh … dòh"

"Are you looking at your pictures?" his mother asked him.

"dòh … dòh"

Text 1.2(b): Nigel at twelve months

Twelve months

Nigel and I were looking at his book together.

Nigel took hold of my finger and pressed it lightly against one of the pictures. "èya," he said.

The meaning was clear: 'you say its name'. "It's a ball," I said.

"è—e—eh" Nigel gave his long-drawn-out sigh, meaning 'yes, that's what I wanted you to do'. He was pleased that his meaning had been successful, and he repeated the procedure throughout the book.

Later he was looking at it all by himself.

"dò … èya … vèu"

This was Nigel's first complex utterance and the only one for many months to come. But it made excellent sense. He had picked up the picture book, opened it at the ball page and pointed at the picture. It was just as if he had said, in so many words, 'Look, a picture! What is it? A ball!'

In the first of these examples, he is exploring the environment and his own relation to it: expressing curiosity, interest, pleasure and so on. This is language to think with, and we can in fact trace the path Nigel took, step by step, from those early protolinguistic utterances to the naming of objects around him and from there to the part of English **grammar**—"transitivity"—that enables him to combine the names into complex representations of experience, such as the clause *strange man gone* said spontaneously at 20 months when he saw someone pulling funny faces. There is a direct link from protolanguage to the use of the grammar and vocabulary of adult language as a **key** with which to interpret experience.

In the second example above, Nigel is not only exploring, but also exploiting: using language to get things done. This is language not to think with but to act with. He may be getting his mother or his father to play with him, or he may be asking for a drink or a favourite toy—but like every human baby, he knows perfectly well that you cannot get possession of an object by talking to that object: you have to talk to a person, who will then (if well disposed) pass the object to you. So this kind of language is essentially interpersonal language, the language of demands (and also of offers; children like to give as much as to get), and once again, it is possible to follow it through as it evolves into the adult language, this time not through the use of words as names of things but through intonation patterns and eventually into the grammar of mood.

So these two motifs—(1) language as a way of thinking about the environment and (2) language as a way of acting in the environment, via the people in it—are present from the start, from the very beginnings of the language of a human child. In systemic functional theory, we refer to these motifs as 'ideational' and 'interpersonal'. These are two of the three most general functions of language, and because these three functions are the underlying principle on which all human languages are built, we refer to them as 'metafunctions', to distinguish them from functions in the sense of just different uses of language. The ideational and interpersonal motifs—language to think with and language to act with—are more than

simply uses of language: they are the fundamental organizing concepts around which the whole of language has evolved over the past two to five million years. And the first significant thing that the human child learns through language is that this is what language is: it is a way of interpreting and of controlling the world he finds around him.

If he learnt nothing else in his first encounters with language, that would be a major achievement. But of course he does learn something else, because within these broad motifs, he is already making meaningful distinctions: between 'I want that' and 'I don't want it', between 'give me something' and 'play with me', between 'where are you?' and 'there you are!', and so on. We can observe all these distinctions evolving in the language Nigel uses himself; if we went further and observed what he understands of what is said to him in return, we should get an even richer impression of what it is that he has learnt through the medium of language—all this before he has ever said a word of his mother tongue at all.

Before following through on the experience of the child, I need to make one thing clear. I have spoken of the child as 'learning through language', and this implies a distinction between (1) learning a language and (2) using that language in order to learn. This is an important distinction and a valid one for our analytic purposes. But we should also acknowledge that from the point of view of the child, these are one process not two. The child is simply learning, and learning as we have stressed is a linguistic activity. He does not distinguish between learning the word *bus*, when he gets to the naming stage, on the one hand, and on the other hand using that word to interpret a particular experience—some noisy monster lumbering past him in the street—and to relate this to **other** experiences which are alike in some respects and different in others (e.g. the same monster when he happens to be sitting comfortably inside it). He may **practise** the word *bus*, out of context; so to that extent he could be said to be 'learning language'—but even there it is doubtful whether there is a very clear distinction between rehearing the sound and rehearsing the experience with which that sound is associated.

The reason we need to remind ourselves of the child's point of view in this regard is simply this: we tend to think as adults—if we think of language at all—that language is simply a passive element in the learning process. We think of our experience as something given and the language as a convenient mirror in which that experience gets reflected. Language 'reflecting' experience is indeed a common metaphor that people use. But it is a misleading metaphor, nevertheless. Language does not passively reflect experience; rather, it creates or 'construes' experience: language is an active participant in the semiotic cycle. It is language that enables us to order and interpret the flux of events in which we find ourselves, the 'mush of general goings-on' as Firth used to call it, so that instead of defining language as that which encodes experience, we can almost turn things round and define experience as the order that is created out of chaos by means of language. To say this is to take the first step towards a language-based theory of learning.

What kind of language are we talking about, in this regard? Clearly not the conceptually complex, tightly constructed metalanguages of science and philosophy (we shall come back to those later). Here, we are concerned with the language of a very small child; even before it has any words, or any structures, language—his protolanguage—is already at the foundations of his learning. Once the child does move into the mother tongue, his language becomes recognizable as language in the adult sense: it gains a 'lexicogrammar', an organization in the form of words-arranged-in-structures like that of *man clean car*. We can easily adapt this to an adult model, something like *there's a man cleaning his car*; indeed, the adult who is being addressed, who was also sharing the experience, typically rewords the child's observation (and did, in fact, on this occasion) in a related adult form: 'Yes, there was a man cleaning his car'. The child gets confirmation, in this way, that his construction of the experience matches that of the adult world: in other words, he has 'got it right'.

The adult's response as we have said is in normal English, with all the grammatical words and morphemes added in place; gradually, the child will incorporate these into his discourse too. But it will still be the ordinary everyday discourse of the home and the neighbourhood: the unselfconscious, unplanned and unwritten-down language of daily life. It is this that is at the foundation of our knowledge, in at least three different ways which we shall need to explore later on. But first I need to draw attention to one further aspect of the child's linguistic experiences. We have noted the twofold character of language in relation to the environment: that we think with language, and we act with language—it is the continuation of the two that enables us to learn. Here are some further examples, this time from the phase of Nigel's transition into the mother tongue.

Text 1.3: Nigel's early mother tongue, in mathetic and pragmatic functions

Pragmatic

chuffa stúck	'the train's stuck; help me to get it out'
high wáll	'let me jump off and you catch me'
háve it	'I want that'
play ráo	'let's play at lions'
squeeze órange	'squeeze the orange'
bounce táble	'I want to bounce the orange on the table, can I?'

Mathetic

Clever boy fix roof on lòrry	'this clever boy fixed the roof on the lorry'
Dada come bàck … Dada come on fast chùffa	'Daddy's come back; Daddy came on a fast train'
too dàrk … open cùrtain … lìght now	'it was too dark; you've opened the curtains, and it's light now'

Now, in all these instances, Nigel learns because the language refers: there is something going on, out there, that creates a context and so enables the child to construe an appropriate meaning. But in addition to this representational property of language, at the same time it is encoding, or encapsulating, for him a great deal of other potential information, about the material and behavioural environment, about the social structure with its interpersonal relationships and about his own place in this complex scheme of things. It does this not just by referring to what is going on but by participating; language enables people to **act out** the social and physical processes in which the child himself is involved. This point is one that is extremely difficult to illustrate, since it depends on the continuity of linguistic interaction over a long period, the ongoing dialogue in which the child is engaged throughout all his early years with those who are looking after him. But let me try.

Nigel has a game, high wall, in which he throws himself full tilt off whatever object he is standing on and has to be caught by his father before he hits the ground. This started harmlessly enough in the park near his home, where there was an old ruined abbey of which only some stunted walls remained; some just one or two courses of stones above the ground—these were the 'low walls'—and some at chest or shoulder height (the adult's, that is)—these were the 'high walls'. Soon any object, such as the arm of a settee or an upturned suitcase, could function as a 'wall' for 'jumping off'. As the months went by, Nigel's 'high walls' got higher and higher, until he was participating himself from a height way above his father's reach—and only barely waiting to ensure his father was there to catch him. This simple expression *high wall* had long since ceased to function as a name for a class of objects; but as a consequence of its extended use, it got a variety of different responses which provided Nigel with a great deal of miscellaneous information from which he was able to learn. Here are just a few:

High wall!

(response:) That's not a high wall; that's only a low wall

> Objects (e.g. wall) and their properties (high/low); properties continuous—no clear boundary high/low, one pole is negative ('*only* low'; one couldn't say 'that's not a low wall; that's only a high wall').

No that wall's too high—you'll hurt yourself

> Concept of 'too much' of some property—undesirable, and reason why—in what respect—undesirable (danger and consequences)—to himself

No Grandad doesn't play high wall; you're too heavy for him

> This time 'too much' is Nigel himself—too heavy; but the focus is on Grandad. He is old; old people are different—not so strong; these are things they cannot do.

Come on now, enough—it's time to go home and have your tea

Things have a time and a place—there is order in daily life, and an obligation to keep to that order, even if it means giving up on something you were enjoying.

Of course—not all is learnt from one event; but the child has hundreds of similar linguistic experiences.

Now, my examples are taken from English, so I should stress that there is no priority to this or that particular language as a vehicle for learning, for the child's construction of reality in this way. Every language is as good as every other language at transmitting the sociocultural environment in which a child is growing up. This after all is the context in which all languages have evolved, and it is important to make it explicit that languages did evolve, slowly and naturally over many hundreds of generations: nobody planned or designed them. The languages in which children live the first years of their lives, the world over, have evolved along with society itself, along with humanity itself, as the discourse of the family and the community—fluent, highly structured, rich in resources, and always relevant to its context. It is the language that people use to live.

So by the time a child is 3–4 years of age, he is well aware of the power of language in enabling him to control his environment—again, in both senses, of thinking about it and acting on it. Ruqaiya Hasan's pioneering research into the linguistic interaction between mothers and children at 3½ years of age shows how penetrating and persistent are the children's demands on language—and therefore their demands on whoever is talking and listening to them, as many a tired mother with attest!—their constant questioning and arguing and experimenting with language (Hasan 1983–1986). Here is an example from one of Hasan's transcripts:

Text 1.4: Example of child–mother interaction from Ruqaiya Hasan's research 'The role of everyday talk between mothers and children in establishing ways of learning'

M. D'you want to have a look at him?
K. Yeah.
M. Poor little moth!
K. Poor little moth! Poor little moth!
M. D'you want to put him on your hand?
K. Mmm.
M. There … what will we do with him?
K. Put him in there—em, leave him there.
M. Okay, we'll leave him up on the side.
K. [sadly] I want him.
M. There'll be other moths. I guess he was happy when he was flying around, and now he's not any more, is he?
K. [crying] no.
M. He can't hurt any more either. I'm afraid little moths do that all the time.
K. Was that a baby one or a big one?

M. No; moths are, em—[banging noise; to Ruth] Hey! Don't bang the oven!—Moths are quite old. When they're little, they're little worms, and—well you know the book about the hungry caterpillar that you've got?
K. Yes
M. He ate and ate until he became a big fat caterpillar.
K. Mm.
M. And then he built himself a cocoon, and then he came out of the cocoon; then he was a butterfly. Well moths also come out of cocoons; but they … they only come out of their cocoons to lay their eggs, and after they lay their eggs they die.
K. Why?
M. Well because they're very old by then. It's the end of their life when they come out of the cocoon, so if he hadn't died there he would have died in a few days anyway.
K. Why did he fall into the hot water?
M. I don't know. But I guess he probably flew low over it, and with hot steam coming up from the water it might have made it hard for him to fly.

Note in particular how much the child is asking questions and the complexity of the mother's answer, because this turns out to be a feature of their discourse which disappears when they get into the educational setting. As the researchers discovered in the 1970s, in Canada and Britain, and subsequently in the USA, children do not ask questions in school—not, at least, in the classroom, when they are occupying their status as pupils. But in the home they do, all the time, and they do listen to the answer, as a parent soon finds out if she gives a different answer next time the question comes round: 'But you said it wouldn't spoil; now you say it will!?' What Ruqaiya Hasan's work is revealing is how important this interaction is, the child's questions and the adult's responses, to the child's progress in learning. Learning is not an individual process; it is social and interactive—we shall always recognize this fact if we interpret learning in terms of language, as I am doing here, since languaging is also a social process. You may talk to yourself, in odd moments—many of us do. But it is only because you talk to others that you have any language to talk with, and even if you are talking to yourself, it is likely that you are simply playing both parts in a game that is still basically dialogic.

The time comes when children are sent to school. This usually happens around the age of five. There are of course very varied practices, in different countries, both in the age at which school is started and in the kind of preschool experience which the children have had—kindergartens, preschools, crèches, Filipino nannies and the like. But school proper usually begins around five or six, and if you ask what the children are sent there to do, apart from keeping out of mischief, the traditional answer was always 'to learn to read and write'. In other words, they go to school first of all for linguistic reasons: to learn to use language in new ways.

Now, there was a time, even as late as the early 1960s, when I was first involved in language education as director of the London project which produced *Breakthrough to Literacy*, when reading and writing were scarcely thought of as language. In fact, at that time, the word 'language' hardly figured at all in educational discussions, and educators like Bereiter and Engelmann in the USA explicitly denied that reading and writing were parts of a child's general experience of language development. We worked hard in the London project to put literacy in its

linguistic context, to bring out the fact that learning to read and write is an extension of the power that children already have, the rich resource of language in its spoken form. Writing extends their language into new contexts and new functions; but it can only do so because the language is already there.

Once this principle came to be accepted that reading and writing were still kinds of languaging, it became possible to ask the question: what is the relation of writing to speaking and of written language to spoken language? These are not simple questions—at least they may be simple questions, but they do not have simple answers. English is still English, whether you are writing it or speaking it, and Chinese is still Chinese. But is it the same English? The same Chinese? At certain times in history, writing and speech have grown very far apart; if, for example, you had lived in China in the Qing dynasty, you would have written only wényán 文言, a form of Chinese as different from the spoken varieties of the language as Latin is from Italian or French. There is much less distance between the two today and much less distance also between spoken and written English. At the same time, written English is definitely not spoken English written down. You **can** take a tape recorder, record conversation and then transcribe it; this is often done, for research purposes, and I have been using examples in my talk today—it is perfectly intelligible, but it is not what you would typically write. The same is true in Chinese, where we also have some transcriptions of spoken dialogues. Spoken and written languages tend to use different forms of expression and different ways of organizing discourse.

These differences are often referred to as 'conventions'. These are said to be different 'conventions' governing written language. This is true enough, in a sense; it is an understandable way of putting it. But at the same time, this formulation has a certain drawback: it suggests that these are some sort of arbitrary rules, a kind of etiquette or table manners—which you have to follow in order to write acceptably. Now, it is true that many written registers do, like those of speech also, acquire certain more or less ritual features—the forms for beginning and ending a letter, for example—which seem to have no function other than signalling that it **is** a letter: a purely indexical function, in other words. But instances of this kind are not the norm. Most features that distinguish some or other functional variety of a language are not arbitrary but motivated; they bear some meaningful relationship to what that variety has evolved to achieve. This will be important when we come to look more closely into the forms of written English, especially scientific English. Of course, it is always possible to have too much of a good thing: such features, even though they are there for good reason, may always be overused and so tend to **become** more or less ritualized. But even then it is important to understand why it was that they came into use in the first place.

To take a very simple and obvious example, we introduce punctuation into written text—capitals, full stops, inverted commas and the like—for a very good reason: we cannot write down the intonation, the rhythm or the voice quality. In speech, all these phonological devices serve to signal the grammatical structure; punctuation evolved to take over this function in writing.

A more complex example would be the order of expressions of cause and effect: in speaking, we usually put the effect first and the cause afterwards, whereas in writing, it is usually the other way round. Reasons for this are rather more complicated; but we will pick them up at a later stage.

Written language evolved, in the course of history, in certain human cultures where people had settled down, produced or at least husbanded their own food instead of hunting and gathering it and begun to engage in new forms of activity for which they needed to keep records: trade, with property owning and taxation; calendrical and astronomical studies; and perhaps certain ceremonial and religious activities. These new **forms** of social and economic life led to convergence between two different semiotic practices: language on the one hand, which up to that time had been purely spoken language, and various forms of pictorial representation on the other, such as paintings on the walls of caves. Over a period of time, the pictures came to stand not for things and events but for words—items in the language, and when that happened, you had reached the stage of writing. Writing then evolved along different lines with different languages; that is not something that will concern us here. What will concern us, however, is what lies behind these new activities for which writing, and written language, first evolved.

Keeping records is a simple enough idea; it makes us think of documentation and filing systems, invoices and bills of lading, tables of facts and figures—or in these days of the electronic office, computers and floppy disks. But think of these still as forms of language and compare them with the language you speak. They represent very different kinds of **demand** that we make on language. When language is used to store and accumulate information in this way, it is functioning very differently from the way it is functioning in spontaneous, natural conversation, or even in oral narrative or religious ritual. It represents a different form of knowledge: knowledge that is stored, but can be consulted; that is frozen, but can be accumulated. This is a new way of construing the social and material environment. The new forms of written language which evolved, over many centuries, in the context of these new functions constituted in important ways a different theory of reality: complementary to that one based on spoken language, neither more true nor less true, but bringing a different dimension to our picture of the world we live in.

So when children go to school and become literate, they are not simply extending their linguistic powers into a new channel; they are learning a new way to learn. They are moving from the world of 'commonsense knowledge', which is typically spoken, into the world of 'educational knowledge', which is typically written down. This distinction, between commonsense knowledge and educational knowledge, plays a significant part in shaping the social system and in defining the individual's access to and participation in social processes. Commonsense knowledge is fluid; it lacks clearly defined stages or clear-cut boundaries (which does not mean, on the other hand, that it lacks structure). Educational knowledge is compartmental, subject (as Bernstein described it) to classification and framing: that is, it is organized into subjects and presented in measured doses according to a master plan we call a curriculum. But the fact that it **can** be classified and framed in this way means that it is a different **kind** of knowledge; commonsense knowledge is

learnt ('picked up' is a favourite metaphor), and educational knowledge has to be taught. Another way of expressing this is to say that educational knowledge is 'technical' knowledge, which means that such knowledge has to have its own special language—so we talk about 'technical terms', or if we do not understand them, we call them 'jargon', which simply means technical language used by somebody else.

But behind the institutionalized learning, and the technical vocabulary, in which educational knowledge is enshrined is a further, deeper distinction which again we can see most clearly if we approach it through language. The specialized words that are listed in a technical dictionary are the clearest signs, the indices of a particular discipline; they are a necessary part of the register. But behind these lies the more general phenomenon of a technical **language**: a style of meaning that is expressed as much through the grammar as through the vocabulary. In fact, we cannot really distinguish vocabulary from grammar in language; the two are simply the same thing seen from different ends, so that it is more helpful to refer to a single, unified concept of 'lexicogrammar'. Technical language, then, embodies different grammar and vocabulary because it embodies distinct semantic patterns, different ways of organizing meaning. Its characteristic lexicogrammatical features are not just different ways of saying the same things; they are ways of saying different things, which cannot be said in the language of everyday discourse. So when children go to school to learn different forms of language, they are not simply being dressed up in neat new linguistic clothing. They are being initiated into new ways of learning and new forms of knowledge.

Up to now, we have assumed a simple dichotomy: commonsense knowledge is associated with speaking and listening, and educational knowledge is associated with reading and writing. This explains why the first task of a child coming into school is to learn to read and write. But expressed in this way, it is obviously oversimplified. For one thing, we need to make clear what distinction it is that we are talking about. On any particular occasion, we are operating in a given **channel**: the language is being transmitted either as sound, which we can hear, or as writing, which we can read (of course both may be involved, as when someone reads aloud from a written text). But the channel must be distinguished from the **mode**: that is, whether the language—the meanings expressed, and the grammar and vocabulary in which they are represented—is that which is typically written, or that which is typically spoken. In the case of the mode, unlike the channel, we have a continuum: in a clearly **written** mode, or in a clearly **spoken** mode, or in something that lies somewhere in between. And here of course the picture gets complicated, because what distinguishes the written from the spoken mode is not one simple feature but a whole syndrome, an assemblage of different features (mainly grammatical features) that typically go together but can in fact vary independently of one another. And different kinds of writing—for example, different subjects in the secondary school curriculum—use different mixtures.

Scientific English, of the kind that we find in learned journals, typically uses a rather extreme variant of the written mode. Even in textbooks and popular journals, we find a strongly marked package of features characteristic of writing, which

suggests that there is some reason behind it: some inherent connection between the goals of scientific discourse and the semantic styles that evolved in written language.

What are some of the linguistic features that we might expect to be characteristic of scientific texts—not at any very technical level, but as we might find them in a school science textbook. Here are five predictable features of such a text:

1. Things have names, as they do in commonsense language; but here the names are organized in taxonomies—on the basis either of hyponymy (*a* is **a kind of** *x*) or of meronymy (*b* is **a part of** *y*).
2 Related to the last: things are classified, according to partial likeness, so they share common properties, and these properties have names, which are also taxonomized.
3 Things can be described, and defined, in terms of other things, of their properties and of the processes they enter into.
4 Processes are sequenced, by time or cause (one follows, or results from, another); such sequences are related so as to form the steps in an argument.
5 A set of related phenomena—a sequence of processes, or an abstraction of some other kind—is summarized so that it can initiate a further sequence of steps. This summary is what we mean by a technical term.

Here is a specimen text from a science course written for the upper primary class:

Text 1.5: 'Animal protection': primary school textbook

ANIMAL PROTECTION. Most animals have natural enemies that prey on them … Animals protect themselves in many ways.
Some animals rely on their great speed to escape from danger. … Animals like snakes and spiders protect themselves with bites and stings, some of which are poisonous. These bites and stings can also help the animals capture food.

[R.L. Vickery et al. The Process way to Science, 1978]

None of these features by itself involve any great departure from the language of commonsense knowledge; yet taken as a whole they impart a distinctive flavour to the discourse. I shall come back to this part for more detailed study later on. In the next lecture, we shall start with a scientific text also addressed to a young readership, but written in the year 1391: written in fact by Chaucer for the education of his 10-year-old son. We shall find that this same set of features is already clearly present. The language is very different from what we would be likely to find in a novel, or a piece of conversation.

What is the relationship between these properties, the sum total of features that gives this discourse its particular flavour, its special semantic style, and the fact that it is **written** discourse? Could such a way of wording have evolved in speech, or in a language which had not yet come to be written down? It is perhaps unlikely, although we need to be careful in trying to answer this. If this kind of discourse seems to be in a characteristically written mode, this is **not** because there is any lack

of structure in spoken language. Spoken language is every bit as highly structured as written, and capable of engendering equally complex patterns of discourse, as can be recognized from the narrative texts of oral literatures, and those from literate cultures which were first transmitted orally. (Or else we can simply tape-record natural spontaneous conversation and see how intricate it can become in the organization of its grammar.) If the above sample text is essentially written rather than spoken language, there must be some more specific feature involved, and it has to do, it seems, with the orientation of the discourse towards **things** rather than towards actions, or towards doing. Not simply that it has more nouns, where spoken language would have more verbs—that may be true, but it is not the significant issue. The question is rather one of what kinds of phenomena are treated as objects rather than as processes. There is not in these examples any of the highly complex 'objectifying' that is characteristic of contemporary scientific discourse; but there are the signs of this to come, in expressions like *these animals need some protection from their enemies* where happenings are worded as things, so they can be talked about and made the point of departure for other happenings that are to follow, compare *speed*, *protection*, *bites* and *stings*. It is this way of organizing meaning that is characteristic of written language. This is so, at least, in English; we shall need to pose the question whether it is true of written languages in general.

Our children, then, come to school not just to learn to read and write (to master the new medium) but to learn the written language, which is the language of educational knowledge. Of course the two are closely connected: written language is usually (though not always) encoded in writing, so you have to be able to read and write in order to gain access to it. (And equally, it is useful to be able to read and write for other purposes than just acquiring educational knowledge.) But written language is the primary concern. In subsequent lectures, we will look a little more closely at this written language, and its evolution into its present form, before returning to the language development of children in relation to their overall learning experience, including both their learning before they come to school and their learning in the process of education, and then consider the nature of educational knowledge, and specifically scientific knowledge, particularly from a linguistic point of view. My attempt will be to use **language**, and a particular view of language and its role in society, as a means of linking these rather diverse topics in a common interpretative frame. Inevitably, this will involve a certain amount of linguistic **theory**—but we should not be shy of theories; a theory is simply a way of improving practice, a means of acting more effectively towards some particular goal. Here, I have in mind educational goals, and I hope that a linguistic theory of learning may suggest, for example, some directions for teacher education and development, e.g. in in-service workshops and seminars. No one makes more demands on language than teachers do, and the better we understand the nature of these demands, the more we can modify our practice to help the learners in their very demanding task.

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Chapter 2
The Evolution of a Language of Science

From some time in the first year of life, a human infant is communicating with those around him, and his acts of meaning follow two broad functional motifs, one the 'ideational' (language as a way of thinking) and the other the 'interpersonal' (language as a way of acting). These two motifs, or metafunctions of language, constitute the fundamental semiotic resources with which we gain some mastery of our environment; they are in fact the two aspects that are involved in any kind of meaningful activity. In order to achieve anything, we have both to **understand** some domain and to **act** in some way upon it. It is not surprising therefore that all human languages, both infant protolanguage and every adult language spoken anywhere on this planet, are organized around these two complementary functions. In adult language, they lie at the foundations of grammar.

Now, the **infant** does not yet have a grammar—there is no grammar in protolanguage, only meanings and their expressions (in sound or gesture). But these two functions are clearly present, and clearly distinct, from the start, and they seem to constitute the principal strategy that children use for making the leap from their protolanguage into the mother tongue. Children take this step in the space of just a few months. With the human race, it probably took two million years. In my opinion—and I stress that it is only an opinion—it is likely that our babies are in fact recapitulating the linguistic evolution of the human species (just as in embryo they recapitulate biological evolution), but we shall never know. All languages spoken in the world today represent a fully evolved state—there is no such thing as a simple or primitive language, and when children start to speak in their mother tongue, they simply leap over those hundreds of thousands or millions of years that our languages took to evolve to their present state.

So we cannot watch the system of language evolving; we have to take it as it is, ready made. We can however track some of its very **recent** evolution, and today, I want to follow the historical trail in one particular manifestation, that of the evolution, in English, of modern scientific discourse. And while such an excursion into history might seem at first sight to be just a pleasant diversion, something of an academic luxury, I think it is rather more than that: I think this historical perspective can give us some additional insight into the kind of language that our children have to come to terms with when they go through their years of school.

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In the previous lecture, I referred to the distinction between commonsense knowledge and educational knowledge, a distinction that is drawn by sociologists, in the sociology of knowledge. I used the sociologists' labels, but I emphasized that the distinction, as I was drawing it, is a linguistic one. It would be nice if we could say there was no difference, between the everyday, natural, typically spoken language of the home and neighbourhood and the technical, somewhat contrived, typically written language of educational disciplines, but in fact there **is** a difference, and it is one that we have to recognize and interpret. Educational discourse is something that children have to learn, and with which they may have problems. Such problems will be difficult to overcome if their teachers do not understand the nature of the linguistic demands that are being made on them. Furthermore, many of these problems arise just as much in monolingual education systems as they do in multilingual communities. So it is particularly important to be able to recognize what are the linguistic demands that are imposed simply by the process of becoming educated—of having to learn the discourse of mathematics, of science, of history, of economics and so on. We can then ask how such problems become further complicated if more than one language is involved.

So the purpose of today's talk is to try to identify the essential nature of scientific discourse, taking this as **one** of the registers of language in education: one that is obviously important because of the central place that science **has** in education, but also because it exhibits in a rather clear and sometimes extreme fashion the features that are found in the language of educational disciplines in general. At first, I had intended just to examine scientific language as we find it today, but then in order to explain its particular features, and to suggest that they are not merely arbitrary conventions, I thought it might be more effective to show something of how they had evolved. This would be another application of the historical approach: another beginning, so to speak, except that we cannot in this space of time go right back to the earliest origins.

Today, then, we shall explore some aspects of the language of science as it has been evolving in English since the fourteenth century. I shall examine passages written by four masters in the field: Geoffrey Chaucer, Isaac Newton, Joseph Priestley and James Clark Maxwell. We can identify these passages by their time intervals: each of the works I have chosen was written fairly late in a particular century:

Chaucer:	A Treatise on the Astrolabe	1391
Newton:	Opticks, or, a treatise of the reflections, refractions, inflections and colours of light	1675–87
Priestley:	The History and Present State of Electricity, with original experiments	1767
Maxwell:	An Elementary Treatise on Electricity	1874

So, roughly the data from one hundred, two hundred, three hundred and six hundred years ago. We will begin with Chaucer—who will no doubt be more familiar to many among you as the author of the Canterbury Tales, but who was also a not inconsiderable mathematician and astronomer.

In the year 1391, Geoffrey Chaucer wrote a scientific treatise for his son Lewis. It is known, now, as the Treatise on the Astrolabe, and much of it is an account of the workings and use of the astrolabe, which was the principal astronomical instrument at that period. The treatise was in fact written to accompany an astrolabe which Chaucer had given his son as a present. 'Litell Lowis' was then ten years old.

The treatise was written in English. 'I have given you', Chaucer writes:

> *an Astrolabe suitable to our horizons, constructed for the latitude of Oxford; and by means of this little treatise I propose to teach you a certain number of principles relating to this instrument. ... I will write the treatise for you*
>
> *<under ful lighte rewles and naked wordes in English>*
>
> *using simple structures and plain words in English; for Latin you know only a little. But let these true principles suffice for you in English as well as do the same principles for the noble Greek clerics when written in Greek, for the Arabians in Arabic, for the Jews in Hebrew and for the Latin peoples in Latin ...*

The treatise was to have been in five parts, the fourth and fifth being designed as 'a theory to describe the movings of the heavenly bodies, with their causes' and 'an introduction based on the writings of our scholars <doctours>, in which you can learn a great part of the general rules of theory in astronomy <the general rewles of theorik in Astrologie>'. Unfortunately, only the first two parts were written, or at least only these have survived.

Chaucer does not claim the treatise to be original; he says 'I am only a crude compiler of the work of the old astronomers <Astrologiens>, and have translated it into my English just for your instruction'. But it does not appear to derive from a single original; it is I think a compilation rather than a direct translation. Be that as it may, the treatise is of interest as an early essay in technical, scientific English.

Here is a short extract from Part I, which is a description of the astrolabe itself, followed by a passage from Part II which teaches little Lewis how to use it.

Text 2.1: Extracts from Chaucer's Treatise on the Astrolabe

(I.17)
The plate under thy riet ['grid'] is descryved ['inscribed'] with 3 principal cercles; of whiche the leste ['smallest'] is cleped ['called'] the cercle of Cancer, by-cause that the heved ['head'], of Cancer turneth evermor consentrik up-on the same cercle. In this heved of Cancer is the grettest declinacioun northward of the sonne. And ther-for is he cleped the Solsticioun of Somer; whiche declinacioun, after Ptholome is 23 degrees and 50 minutes, as wel in Cancer as in Capricorne.

(II.17)
Tak the altitude of this sterre whan he is on the est side of the lyne meridional, as ney as thou mayst gesse; and tak an assendent a-non right ['straight ahead'] by som maner sterre fix which that thou knowest; and for-get nat the altitude of the firste sterre, ne thyn assendent. And whan that this is don, espye diligently whan this same firste sterre passeth any-thing the south westward, and hath him a-non right in the same noumbre of altitude on the west side of this lyne meridional as he was caught on the est side; ...

Let me note at this point just a few features of the language Chaucer uses. (1) There are of course numerous abstract words: conclusion, declaration, altitude, declination, evidence, equation, mediation, utility, proportion, etc.; most of them are nouns. (2) Some of these abstract nouns function as technical terms, e.g. *declination* (=angular distance of heavenly body from celestial equator), *head/heved* (=point where sun enters the zodiacal sign), *climate* (=segment of the surface of the earth by latitude and longitude), and of course *latitude* and *longitude, meridian*. (3) There are nominal groups (that is, expansions of nouns) formed with prepositional phrases with *of*: *Solsticioun of Somer, the circle of Cancer, the spaces of the hours of planets, the poles of this world, the zenith of the sun and every star.* (4) There are expressions of general principle, e.g. adverbs such as *evermor* (=always), but also expressions of the kind 'anything that is *a* is also *x*' (*any two degrees that are the same distance from either of these two hevedes are of the same declination*). (5) In giving instructions, Chaucer uses some action-type verbs (*take the altitude of this star*), and numerous mental processes (*understand well, forget not, reckon, trust well, espy*). Otherwise, a frequent type of clause is one having the verb *be*; this may be assigning an attribute to something (*when the sun is near the meridional line*), or else stating an identification (*the latitude of any place in a region is the distance from the zenith to the equinoctial*). (6) There are expressions of cause and condition: *when, if, because, for, and therefore.* (Note that one common context for these is explaining a technical term: *the last is called the circle of Cancer because the head/heved of Cancer always turns concentric upon this circle*.) (7) Various devices exist to carry forward the argument step by step, for example non-defining relative clauses (*the names of the stars are written in the margin of the Rete where they are located; of which stars the small point is called the Centre*)—this is actually an instance of a varied set of features whereby a particular entity is introduced into the discourse and then kept track of through a paragraph or more of the text.

These are some of the features of a piece of scientific English as it was beginning to emerge some six hundred years ago. From the modern point of view, it is perhaps technical rather than scientific as we would understand this term today; but we should not I think draw this distinction too sharply. It is clearly already a language for reasoning with, in which statements of general principle can be made and conclusions drawn from real or hypothetical premises. Of course, the **evolution** of this kind of technical discourse in the west took place in ancient (pre-classical and classical) Greek, in classical and medieval Latin; not in English or French or Italian or any of the modern European languages. But it is the subsequent developments we need to be concerned with, leading up to the forms of technical and scientific English that we are typically confronted with today, and for this purpose, it is reasonable to take the scientific English of Chaucer as our point of departure. It is interesting also to compare its linguistic features with those of the primary science textbook I illustrated in the previous lecture (bearing in mind that Chaucer intended it for his 10-year old son whose Latin was not very good yet).

From Chaucer we will move forward 300 years, to Isaac Newton whose 'Treatise on Opticks' was written towards the end of the seventeenth century. This period of three hundred years (1400–1700) is usually regarded as critical in Western scientific

thought, encompassing as it did the 'birth of scientific method' with Copernicus, Galileo and Newton. Although experimental science was foreshadowed in earlier medieval times, particularly in the work of Roger Bacon, it did not become established until the period of the Renaissance, and Isaac Newton did more than any other single scholar to establish experimental method as the new scientific paradigm. Let us look at some specimens of Newton's writings. Much of his work was written first in Latin and then translated, but the Opticks was composed from the start in English.

Text 2.2: Extract from Newton's *Treatise on Opticks* (Experiment 4)

In the Sun's Beam which was propagated into the Room through the hole in the Window-shut, at the distance of some Feet from the hole, I held the Prism in such a Posture, that its Axis might be perpendicular to that Beam. Then I looked through the Prism upon the hole, and turning the Prism to and fro about its Axis, to make the Image of the Hole ascend and descend, when between its two contrary Motions it seemed Stationary, I stopp'd the Prism, that the Refractions of both sides of the refracting Angle might be equal to each other, as in the former Experiment. In this situation of the Prism viewing through it the said Hole, I observed the length of its refracted Image to be many times greater than its breadth, and that the most refracted part thereof appeared violet, the least refracted red, the middle parts blue, green and yellow in order. The same thing happen'd when I removed the Prism out of the Sun's Light, and looked through it upon the hole shining by the Light of the Clouds beyond it. And yet if the Refraction were done regularly according to one certain Proportion of the Sines of Incidence and Refraction as is vulgarly supposed, the refracted Image ought to have appeared round. So then, by these two Experiments it appears, that in Equal Incidences there is a considerable inequality of Refractions. But whence this inequality arises, whether it be that some of the incident Rays are refracted more, and others less, constantly, or by chance, or that one and the same Ray is by Reflection disturbed, shatter'd, dilated, and as it were split and spread into many diverging Rays, as Grimaldo supposes, does not yet appear by these Experiments, but will appear by those that follow.

1. First let us look at the kinds of process he is writing about—the actions, events and so on:

   (a) *I held the Prism. I stopped the Prism. I removed the Prism. I held a white Paper*
   (b) *I looked through the Prism upon the hole*

These clauses express actions on objects, and also behaviour. They may be followed by a mental process of cognition or perception, together with a projected observation of fact:

I observed the length of its refracted image to be many times greater than its breadth.

We found similar clauses in Chaucer, as instructions, also sometimes followed by a mental process with its projection:

Take the altitude of this star ... and forget not the altitude ...And when that this is done espye diligently when this same first star passeth anything the southwestward

But Chaucer's of course had the imperative mood, Subject 'you'; Newton's are declarative, past tense, Subject 'I', describing an experiment. Since they are describing an experiment, these clauses sometimes appear in the passive.

The Sun's Beam was propagated
One and the same's Ray is by Refraction disturbed, sheltered, diluted, split and spread

It is interesting to note that these are *not* the 'suppressed person' passives that modern writers use (and teachers and editors often insist on) to make the discourse seem more objective; they simply describe what happened as a **result** of an experimental step he had taken.

Then in addition to the actions, behaviours and mental processes which are characteristic of Newton's experimental descriptions, we find a large number of attributive descriptive clauses with *be* and similar verbs used to express the results of his observations:

	is homogeneal/heterogeneal
its Axis might be perpendicular to that Beam	*remain still a middle colour*
the refracted image ought to have appeared round	*grow more and more dilute*
	made the Paper look white
	it appeared of that Colour to which it approached nearest

The other type of relational clause, with *be* in its identifying (equative) sense—and, again related verbs like *is composed of*—typically occurs in mathematical contexts:

The proportion of __ is composed of__ and of __if __ be to__ as 20 to 31

2. Now let us look at the **things**—the objects and abstractions. There are of course many technical terms:

Text 2.3: Examples of technical terms

general concepts	*light colour ray beam image*
apparatus and its use	*prism lens focus*
geometric and trigonometric terms	*perpendicular Sine axis*
theoretical concepts	*spectrum refraction refrangibility incidence reflected light/transmitted light heterogeneous rays*

As with Chaucer, these often involve nominal group constructions with prepositional phrases following the noun; but now they are getting a little bit longer:

the common Sine of Incidence out of Rain-water into Air,

the excesses of the Sines of Refraction of several sorts of Rays above their common Sines of Incidence

In the Sun's Beam which was propagated into the Room through the hole in the window-shut

(hold the Prism in) such a posture that its Axis might be perpendicular to that Beam

What is the function of these phrases and clauses that occur as postmodifiers to the noun?

Given that a common noun, e.g. 'beam', is the name of a class of phenomena (objects), all these postmodifying elements—prepositional phrases and defining relative clauses—have an important role in telling us **which** particular member of the class is being referred to:

> *The Beam < which Beam? > ... which was propagated into the Room through the hole in the window-shut*

Now, there is nothing unusual about the pattern; it happens in spoken English all the time, and children master it at a very early age. A three year old would have no great difficulty in processing that last example. But there is an additional feature, or syndrome of features, appearing in Newton's scientific writing, particularly in the mathematical sections, that was much less evident in Chaucer, and which a 3 year old would have rather more trouble with.

3. The complexity displayed in the mathematical sections of Newton's treatise was typically characterized by a single clause with only three elements, but very long and complex nominal groups, as in the final two paragraphs of the following (Experiment 8):

Text 2.4: Extract from Newton's *Treatise on Opticks* (Experiment 8)

EXPER. VIII

I found moreover that when Light goes out of Air through several contiguous refracting Mediums as through Water and Glass, and thence goes out again into Air, whether the refracting superficies be parallel or inclined to one another, that Light as often as by contrary refractions 'tis so corrected, that emergeth in lines parallel to those in which it was incident, continues ever after to be white. But if the emergent rays be inclined to the incident, the whiteness of the emerging Light will by degrees in passing on from the place of emergence, become tinged in its edges with Colours. This I tryed by refracting Light with Prisms of Glass placed within a prismatick Vessel of Water. Now those Colours argue a diverging and separation of the heterogeneous rays from one another by means of their unequal refractions, as in what follows will more fully appear. And, on the contrary, the permanent whiteness argues, that in like incidences of the rays there is no such separation of the emerging rays, and by consequence no inequality of their whole refractions. Whence I seem to gather the two following Theorems.

1. *The Excesses of the sines of refraction of several sorts of rays above their common sine of incidence when the refractions are made out of divers denser mediums immediately into one and the same rarer medium, are to one another in a given Proportion.*

2. *The Proportion of the sine of incidence to the sine of refraction of one and the same sort of rays out of one medium into another, is composed of the Proportion of the sine of incidence to the sine of refraction out of the first medium into any third medium, and of the Proportion of the sine of incidence to the sine of refraction out of that third medium into the second medium.*

Consider another nominal group of a similar kind just with prepositional phrases in it

a diverging and separation of the heterogeneous Rays from one another

Here, the nouns that are being modified in this way are 'diverging' and 'separation'. But notice that these nouns are not names of things and objects; they are names of happenings and processes. We could paraphrase this as:

the heterogeneous Rays diverge and are separated from one another

The full sentence reads:

Now those colours argue a diverging and separation of the heterogeneous Rays from one another by means of their unequal Refractions

and we could reword this whole clause as something like:

those Colours argue that the heterogeneous Rays diverge and separate from one another by means of their unequal Refractions

turning 'diverging' and 'separation' back into verbs and using a *that* clause. Once we have done this, of course, we might go further, and say

from those Colours we could argue (or infer) that ...

– after all **we** do the arguing, the Colours do not, and then at the end say

because they are refracted unequally

Now, this sounds more like spoken English. Notice what Newton is doing here. He is using nouns to refer to events—or let us say, nouns to refer to 'processes', rather, as a more general term than events; not only those that are part of the technical discourse, like *refraction*, but also others of an everyday kind like *diverging* and *separating*.

Here is another example:

The explosion of Gunpowder arises therefore from the violent action whereby all the Mixture ... is converted into Fume and Vapour

which again we could reword as

Gunpowder explodes therefore because all the Mixture is violently converted into Fume and Vapour

In these examples (and of course others of a similar kind), Isaac Newton is moving towards the nominalized forms of expression, the 'nouniness' that we associate with scientific language today. Not very far but in that direction. This does not mean he is using a lot of nouns—there are a lot of nouns in any kind of English, and there were a lot of nouns already in the Chaucer. But while Chaucer's nouns were mainly either concrete objects or else **technical** abstractions, such as *declination* and *solstition*, with Newton we are also finding nouns of a non-technical kind used to express meanings that would more congruently be expressed by verbs:

a diverging and separation of the Rays: the Rays diverge and separate

the explosion of Gunpowder: Gunpowder explodes

the improvement of Telescopes: Telescopes are improved

But there have to be verbs, in English discourse, to carry tense, polarity and the like; so if the processes are expressed as nouns, where do the verbs come in?—The verb in the first example was *argue*: in other words, what Newton is here treating as the event, the 'process', is the act of reasoning, or—since it has *Colours* as its actor (*these Colours argue*)—the relationship of 'proof' that he is setting up between the results of the experiment and his conclusion. In the second example, the verb is *arise*: the explosion of gunpowder 'arises from' the action of the Mixture; so here what is being treated as the process is the relationship of 'cause' between the two events. The events themselves have become nouns, while verbs are used just to express the relationship between them.

And this syndrome has become a kind of key signature in modern scientific discourse. What Newton is doing is building a form of metaphor into his language; but it is a grammatical metaphor, rather than a lexical or word metaphor such as we associate with literary discourse. A grammatical metaphor is one by which the things (phenomena) he is talking about are expressed in the grammar in ways which diverge from the way they are interpreted in the grammar of everyday language, where nouns stand for things, events are expressed as verbs, and the relations **between** events by other word forms, mainly conjunctions and prepositions.

4. Finally, we may note Newton's use of complex multiclausal structures, for example:

If the Refraction were done regularly according to one certain Proportion of the Sines of Incidence and Refraction as is vulgarly supposed, the refracted image ought to have appeared round.

Some express the manner in which something is done, for example:

not only by teaching those things which tend to the perfection of vision, but also by determining mathematically all kinds of Phenomena of Colours which could be produced by refractions.

Some are *that* clauses, used in reasoning, for example:

And, on the contrary, the permanent whiteness argues, that in like Incidences of the Rays there is no such separation of the emerging Rays, and by consequence no inequality of their whole Refractions.

And occasionally as an earnest of his own good faith, see the final section of the extract:

... and by the successes I met within the Trials, I dare promise, that to him who shall argue truly, and then by all things with good Glasses and sufficient Circumspection, the expected event will not be wanting.

Now, we will move forward by a century at a time, taking a brief glance next at Joseph Priestley writing on the history and present state of electricity. When I borrowed his book from our library in Sydney, the assistant was puzzled by its title: how can you write a history of electricity? And this illustrates one of the interesting quirks of English scientific language: we tend to give the same name both to a phenomenon and to the study of that phenomenon: thus in linguistics, *grammar* means both grammar (that is, a particular system within a language) and the study of grammar; Chinese 語法 and 語法學 (Grammatology[1] would be a useful term if not already used for something different.) So here, we need a term electricology for the study of electrical phenomena; then, a history and present state of electricology would be quite acceptable.

Text 2.5: **Extract from Joseph Priestley's *The History and Present State of Electricity, with Original Experiments***

According to this theory, all the operations of electricity depend upon one fluid sui generis, extremely subtile and elastic, dispersed through the pores of all bodies; by which the particles of it are as strongly attracted, as they are repelled by one another. When the equilibrium of this fluid in any body is not disturbed; that is, when there is in any body neither more nor less of it than its natural share, or than that quantity which it is capable of retaining by its own attraction, it does not discover itself to our senses by any effect. The action of the rubber upon an electric disturbs this equilibrium, occasioning a deficiency of the fluid in one place, and a redundancy of it in another. The equilibrium being forcibly disturbed, the mutual repulsion of the particles of the fluid is necessarily exerted to restore it.…

Although there is no word electricology in Priestley's text, there are various other derivatives of *electric*: *electricity, electrical, electrify*, *electrified*, *electrification* and *electrician* all occur, though not exactly in the senses in which we expect them today. (An electrician is a researcher in the field, not someone who comes to mend the wiring in your flat.) These show an important development in scientific English: the use of the morphological resources borrowed from Greek and Latin to create an indefinite number of new related words, a potential which as you will easily recognize is widely exploited in scientific English today. These new words, in turn, serve in the formation of innumerable larger structures—groups, phrases and clauses, with the nominal group as the favoured construction: *electric light/fire* (again not in the modern senses!), *electric fluid, electrical battery, electrical experiment, excited electricity, communicative electricity, medical electricity, conductor of electricity, positive* and *negative electricity*—(the term 'electric shock' also belongs to this period: electric shock was frequently tried in medical treatment, for paralytic conditions such as tetanus, and as a curiosity, when large numbers of people joined hands in a human chain, in one case across the river Thames, and an electric shock administered at one end of the chain was transmitted all the way to the people at the other end!)

[1] I subsequently called the study of grammar "grammatics"—MAKH.

As far as the semantic and grammatical features of the discourse are concerned, we find further developments in the directions already noted in Isaac Newton's writing: notice how the technical terms are used to summarize so as to carry the argument forward step by step:

> *... one fluid sui generic, extremely subtle and elastic, dispersed through the pores of all bodies; by which the particles of it are as strongly attracted, as they are repelled by one another.*

– all this now summarized as *this fluid*, in

> *the equilibrium of this fluid, in any body*

which in turn is then summarized as *this equilibrium*, in

> *this equilibrium being forcibly disturbed;*

and so on. Again as in Newton, but more so, nominalizations increasingly take over all the semantic content, leaving the verbs to express merely the relations **between** the processes in question:

> *Is not the **repulsion** owing rather to an **accumulation** of the electric fluid on the surfaces of the two bodies, which accumulation is produced by the **attraction** of the bodies, and the difficulty the fluid finds in entering them?*

Let us first reword this by 'unpacking' the grammatical metaphor:

> *Do not [the electric atmospheres] repel each other because electric fluid has accumulated on the surfaces of the two bodies, [which in turn is] because the bodies are attracted and the fluid cannot easily enter them?*

But instead of a verb *repel*, we have a noun *repulsion*; instead of *accumulate*, *accumulation*; instead of *attract*, *attraction*; and instead of the adverb *not easily* (hardly), the noun *difficulty*. The happenings (processes)—actions, events, etc.—have become nouns. So what do the verbs do?—again, they express the relationship between the happenings. Instead of the conjunction *because*, we have the verbs *produce* (is produced by) and *owe* (is owing to), or a verb to express the mental process of having an opinion—*conceive*:

> *Some of the patrons of the hypothesis of positive and negative electricity conceive otherwise of the immediate course of this Repulsion*

– everything else again being nominalized. This recalls Newton's use of *argue*. Material processes—where the happenings are coded as verbs—remain only in the description of the experiments.

We have already put forward a partial hypothesis for why this development in the grammar is taking place; let us restate it in more systematic form. (1) The **nouns** (e.g. *fluid, equilibrium, repulsion, accumulation*) have a particular function in the **text**: they restate, in summary fashion, what has gone before so that it can serve as a point of departure for what is coming next (that is why you so often find an anaphoric deictic with them, e.g. *this* as in *this repulsion*, meaning 'what I have just

been talking about'). (2) Secondly, the nouns have a particular function in the **system** of the language: they are **technical terms**, which means that they are part of the theory—not as isolated terms, but in their systematic relationship one to another. *Equilibrium* is a recognized state which can be disturbed, or maintained; *repulsion* is opposed to *attraction*, both being kinds of force; and so on. There can be no theory without configurations of concepts such as these, and they have to have names. So this kind of nominalization is clearly motivated, **both** in the system of the language **and** in the text.

But we need to account not merely for the **nouns** but also for the nominal groups, where again we find long accumulations of prepositional phrases:

the mutual repulsion of the particles of the fluid

some of the patrons of the hypothesis of positive and negative electricity

an accumulation of the electric fluid on the surfaces of the two bodies

the practicability of firing mines by electrical explosions

– and so on; as those were already becoming apparent in our earlier texts. Now, why does Priestley write *the mutual repulsion of the particles of the fluid is necessarily exerted* instead of *the particles of the fluid necessarily repel each other*?

To answer this more fully, we need to add a third part to our hypothesis, for which we would need to explore another aspect of English grammar; this is one that is perhaps less familiar than the patterns I have been referring to so far, because it was not treated at all in the linguistic tradition on which our school grammars have always been based. This is the part of grammar that is concerned with **texture**, with how the sentences, clauses and phrases of the text are organized—are packaged, so to speak—so that they fit in with each other and form a discourse that is relevant, coherent and achieves its rhetorical effect. After all, we do not speak, or write, in sequences of unrelated sentences. We produce discourse, in stretches which may be of any length, according to our needs, but which will always bear some meaningful relationship to its environment—in other words, it will make sense in its particular context.

If I am using a simple expression—say a greeting to a friend who has not been well recently—I do not need to worry about how it will fit into the context: I can just say 'How are you today?' and the message will be understood. But notice that even here there is quite a lot of possible variation. I can focus on different points.

*how **are** you today?*	–	*general concern: you don't **look** too good*
*how are you **today**?*	–	*I know you weren't very well yesterday*
*how are **you** today?*	–	*I know your husband hasn't been well*

and all of these would make slightly different messages, with different textures. This sort of variation is possible with any kind of structure that has more than one element in it, e.g. *I'm flying to K.L. today*, where the stress is variably applied as in the following:

I'm flying to ***K.L.*** *today*
I'm flying to K.L. ***today***

and so on. Now: I could also vary the order of the words, and say

today *I'm flying to* ***K.L.***

and this has now made a considerable difference to the information that you get from my discourse. If I say *I'm flying to K.L. today*, this is telling you about me: it is as if I was answering some hidden question like 'tell me about yourself—what're you up to?' But if I say *today I'm flying to K.L.*, the implied hidden question is a different one: it is more like 'tell me about today—what's going on today?' Consider the difference between *Next morning I got up out of bed with a new purpose* and *With a new purpose I got up out of bed next morning*. This potential for different ordering becomes especially important when one is building up a long and complex argument, a chain of reasoning, a set of definitions or something else of that kind. It is important, in other words, in technical discourse that the information should be packaged in a way that is appropriate to the context.

Now, there are various aspects to this packaging of information, and various grammatical resources are available for the purpose: putting the word groups and the phrases in the appropriate order is only one part of the picture; but it is a highly significant part of it, at least in English—and also in fact in Chinese. And when you think of putting things in order, then you can immediately recognize that there are always going to be two special places in any order which are likely to be of particular interest: the **beginning** and the **end**. So in languages that **use** word order in this way, to show how the information is to be organized, it is almost always the first position in the clause and the last position in the clause that carry the main burden—the main 'functional load' as we call it. The two do not have the **same** significances of course; putting something first gives a very different flavour from putting it last. But it is through the combination of the two that our discourse comes to make sense.

Let us illustrate this now from the scientific discourse. (I am sorry that these illustrations are so long; but these are discourse effects that we are observing, and therefore, they involve whole stretches of our text.)

According to this theory, all the operations of electricity depend upon one fluid sui generic, extremely subtle and elastic, dispersed through the pores of all bodies;

by ***which*** ***(bodies)*** *the particles of* ***it*** *(****the fluid****) are as strongly attracted, as* ***they are repelled by one another***

The equilibrium being forcibly disturbed ***the mutual repulsion of the particles of the fluid*** *is necessarily exerted to restore it.*

What this **packaging** does is to enable Priestley to make the whole of the message 'particles of the fluid repel each other' into **a single element in the clause**: *the mutual repulsion of the particles of the fluid*. Why?—because he wants the whole of that complex as a single piece of information. Why …?—because he wants you to take it for granted; he is signalling to you that you have heard about it before, and it is now going to become the **point of departure** for a new step in the argument. If he had said *the particles of the fluid necessarily repel each other*, only the words *the particles of the fluid* would be in this first position in the clause—in THEMATIC position, as we call it; the message would be 'I'm telling you something about the particles'. But he is not; he told us that already, and he is now going on from there to tell us something else, something **about** the fact that the particles repel each other—that this is necessary to restore the equilibrium. And the only way you can do this, in English, is by nominalizing: that is to say, by putting all the points together and turning them into a nominal group; so that is what Priestley has done.

So what scientific discourse does, in every language, is to exploit certain resources which are already there in the grammar, but to bring them out of hiding as it were, to exploit them in new ways and to new extents. This ability to package information and distribute it in appropriate ways in the clause is perhaps the most important single feature of written scientific English: without it is impossible to develop an argument. But in order to do it, we have to **objectify** everything: make events look as if they were objects. Again, take the example

the particles of the fluid repel each other

This is a process: *the particles of the fluid* are **doing** something,
and that is how we would typically talk about it. But when we write

the mutual repulsion of the particles of the fluid

This process has been tied up with grammatical tape and has fixed; it becomes a **thing**. *Repulsion* is a grammatical metaphor, which makes the process of repelling (verb) look like an object (noun). Scientific language is amazingly rich in grammatical metaphor—and that is precisely why it can be so difficult to follow.

Moving on to the nineteenth century, let us take a look at the writing of James Clark Maxwell, one of the outstanding physicists of his time, a professor at Cambridge.

Text 2.6: Extract from James Clark Maxwell, An Elementary Treatise on Electricity (1881)

The amount of heat which enters or leaves the body is measured by the product of the increase or diminution of entropy into the temperature at which it takes place.… The consequences which flow from this conjecture may be conveniently described by an extension of the term 'entropy' to electric phenomena.

Here, we will find some features which are by now familiar—and also others coming into prominence for the first time. To start with the phenomena we have just been discussing in Priestley's writing, notice

the amount of heat which enters or leaves the body is measured by

the product of the increase or diminution of entropy into the temperature at which it takes place

where *the amount of heat which enters or leaves the body* is again a thematic package referring (relating) back to the clause *heat has entered or left the body* in the preceding sentence. Note that there is an equally long nominalization—actually longer—at the end, after *is measured by*: a highly convoluted nominal group with masses of prepositional phrases in it. Such packages, in other words, are not only there for **thematic** purposes, i.e. at the beginning, but also for **news value**, i.e. at the end. Just as we put at the beginning of the clause the item the writer wants us to start with, to take as the Theme, the point of departure for the message, so we typically put at the end of the clause the item he wants us to attend to, because it is being given to us as a piece of news. We have heard before about heat entering or leaving the body; now we are being given some further new information about it.

But let us move on to another point, exemplified by the following two sentences:

The entropy of a material system is the sum of the entropies of its parts.

The reversible portion of the thermo-electric effects are subject to the same condition as other reversible thermal operations.

Throughout this passage, there are a few material processes: verbs such as *pass*, *emit* and *absorb* where some physical process is being referred to. Such verbs have been getting fewer and fewer ever since the Chaucer passage; they occur usually only in the description of experiments and have largely disappeared from scientific writing today. What then are the verbs doing? We have already begun to see what they are doing, in the writings of Newton and Priestley. So here with Maxwell:

1. Some are expressing opinions: *We have avoided making any assumption, we may make use of the idea of, always remembering that, we shall suppose, it is proved, we have great reason to conjecture.*
2. All the others are either the verb *be* or one that is related to it, and we must note here what the verb *to be* means, since it is by now the most important verb in scientific English.

The verb *be* has two basic senses. It either assigns something to a class, as in *Mary is a doctor, John is tall* (Mary belongs to the class of doctors, John belongs to the class of tall people), or else it gives an identity to something, as in *Mary is the doctor*, *John is the tallest one*. You can always tell the difference, because the 'identity' clauses can be turned round: you can say *the doctor is **Mary***, *the tallest one is **John***; whereas you cannot turn the attributive examples round: you cannot say *a doctor is **Mary***, *tall is **John***.

Both these kinds of *be* have been appearing in all our specimens from Chaucer onwards. Both likewise appear in this passage: the identifying *be* in the definition just quoted and in formulae, the attributive *be* in, for example:

electricity is or is not a body; entropy is a quantity which ...

the thermal effects of electric currents are in part reversible and in part irreversible
the reversible effects are small

In addition to these uses, the verb *be* combines with prepositions to express circumstantial relations of one kind or another: *are subject to, are according to, is by means of, is due to,* etc.

Now, all these categories have other verbs with closely related meanings: attributive, e.g. *be, become, turn, stay, seem, look, sound, feel;* identifying, e.g. *be, represent, constitute, symbolize, signal, herald, reflect, mean, serve as, act as;* or circumstantial, e.g. *be at, be on, be about, cause, lead to, accompany, follow, produce, dictate, stimulate, demand, require, correspond to, apply to, arise from, flow from, cover, result from, be associated with, be measured by*. By the time of Maxwell, the range of meanings covered by verbs of this type had greatly extended, to the point where much of scientific discourse could be carried forward on the basis of these verbs alone.

These verbs express, not actions and events, nor mental processes—thoughts, feelings and so on—but **relations**: relations of attribution, identity, time, causality, similarity, etc., **between** one element and another. And this is the corollary to what we have just been witnessing. If all our happenings are turned into nouns, then by the same token—as part of the same metaphorical process—the relations between these happenings are turned into verbs. So in a school science textbook, instead of saying

More people smoke, so more people die of cancer of the lung.

the writer says

Lung cancer death rates are clearly associated with increased smoking.

where the verb *associated with* expresses a relation between two distinct processes.

That is the essence of the code our learners have to learn to crack.

So the language of science is functional, like every other kind of language; it has evolved to serve specific needs and specific tasks within society, under particular circumstances in the history of a culture. But, as usual with human institutions, there is a price that has to be paid.

Scientists themselves have been the first to recognize that their language has its limitations, though since they were not linguists, they have not usually understood these limitations very clearly. The pioneers of artificial languages, at the Royal Society in London at the time of Newton—those whose work led indirectly to Roget's *Thesaurus*, 150 years later—were partly motivated by the need for an international form of communication among all countries of Europe, now that Latin no longer was used to serve that purpose; but they also felt that existing languages (Latin itself, but also English, French, German, etc.) were not sufficiently rigorous in their structure, and particularly in their taxonomic organization of the vocabulary—a basic task of scientists at that time being that of classification, the classification of inorganic and organic matter, including all species of animals and plants; and they

felt that our words were used too loosely, so that languages did not provide an adequate resource for encoding and developing their knowledge.

More recently, scientists in our own century, from Einstein onwards, have registered exactly the opposite complaint. They feel that their language is too rigid, too absolute, too single-minded, unable to cope with the fact that the universe as they now see it is indeterminate, relative and fluctuating, so that we have to talk about happenings, the flow of things, rather than objects in a fixed state, and we have to accommodate at one and the same time what appear, from the way we express them in language, to be contradictory interpretations of reality.

These scientists do not know this, but in fact what they are asking is that their own scientific discourse should move rather closer to its origins in everyday language—to the kind of language that we (and this includes our children) use for our ordinary, commonsense encounters with each other and with our environment. Their own discourse—for very good reasons, as we saw—has become **too** 'nouny': it has cemented the flow of experience in which we live, made it seem static, as if changing was a special case instead of being the normal condition in which everything always is.

Here, we begin to see the price that has been paid. One aspect of this is simply the fact that scientific language **is** different. By growing apart in this way, scientific discourse has helped to widen the gap between educational experience and, everyday, commonsense experience. Of course, it is not only scientific discourse that has these properties: the language of bureaucracy also has moved in this direction to a far greater extent, and with far less justification: there is no **need** to write things such as:

Policy also provides for the carriage of children on buses subject to available room

instead of

Children are allowed to travel on the buses provided there is enough room for them

But the fact that these forms are characteristic of scientific writing does create a **distance**, for our children, between what they learn in school and what they learn, and know, of the world outside.

The other aspect of the price we pay is that which the scientists themselves are coming to recognize: that in order to 'fix' the world of the physical and biological sciences, to hold it still in order that it can be studied, the language has had (as I expressed it just now) to cement it: to make it look as though reality consists of a lot of things, fixed sets of objects in fixed relationships. That after all is what nouns, and nominal structures, suggest to us—they suggest this because that is why our languages **have** nouns: to talk about those phenomena that we recognize as **things**. Our everyday, commonsense language creates a world that is a balanced array of things (objects and their properties) on the one hand and of happenings, or processes (actions, events, behaviours, mental processes and relations **between** things) on the other. If we turn everything into nouns, we are building up a one-sided picture of reality, an interpretation of experience that is in conflict with how our ordinary language has led us to understand it. The world of everyday discourse is

very highly organized; but it is fluid and largely made up of events, whereas the world of scientific discourse is made to look like a construction of objects, the only 'events' being the relations that exist among them.

And finally—scientific language does tend to be somewhat ambiguous. This is something I have not touched on today; I shall be returning to it in later lectures, when looking at the language of the subjects studied in school. This may seem surprising, in view of its declared aims, and of the scientists' complaints that it is too rigid; but we shall see that in order to **gain** meaning of one kind—the rhetorical (or textual) meaning that allows each message to be organized as a piece of information in a coherent, logically developing argument—it has had to **sacrifice** meaning of another kind, and this also makes it harder to understand. In the next lecture, I shall return to the perspective of the child, picking up where I left off, to ask how the natural, commonsense language (and the protolanguage before it) with which children have learnt to think about and to act upon the world leads into, and prepares them for, their experiences of learning in school.

Chapter 3
Learning to Learn Through Language

Many years ago, a group of primary school teachers came to discuss with me the topic of an in-service workshop we were planning on the application of linguistics to problems of education in early childhood. One thing we have always wanted to know about, they said, and which is never ever mentioned in the course of our professional training, is 'what do children know of their language before they come to school?' We spent some time in planning a workshop on this topic, in the course of which it became clear that a more appropriate form of wording would be 'what can children do with their language before they come to school?' In other words, it was the functions of language that they were concerned with, in particular its potential as a resource for meaning, rather than its sounds, its words and its structures, although they recognized that there can be no meanings without sounds and words and structures to express them. More specifically, from the point of view of a teacher who was going to take responsibility for such children at the age of five or six, the question 'what can they do with their language?' can be further sharpened to 'what can they do with their language that helps them to learn?' A teacher needs to know what learning power children have already achieved with their language—and this means spoken language, since they are mostly not yet reading—before they come into the infants class, and how much this learning power is likely to prove relevant to the kind of learning they will be expected to do in school.

In the first lecture, I began by looking into the very earliest period in the language development of a child, pointing out that we have to be aware of a stage before the child is learning the mother tongue when he is already in fact talking, addressing meanings to those around him: not, however, to all and sundry, but just to those who he recognizes as the ones looking after him, his 'caregivers' as they are called. These people who are close to the child understand what he says, know that it is making good sense, and respond to him accordingly: they recognize meanings such as 'give me (that)', 'do (that) for me, go on doing it', 'that's interesting', 'I'm tired' and so on. This period in a child's life is referred to as 'infancy': the child is said to be an 'infant', from Latin *in-fantem* 'a non-talker'. If talking means talking in the adult sense, using a **language** such as English or Chinese or Malay, then of course the infant is a non-talker—he does not know a 'language' in that sense; but once we give proper recognition and value to his own

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system of meanings, the protolanguage or 'child tongue' he has developed for his own purposes, then it becomes clear that he is anything but a non-talker. Probably, most children develop some protolinguistic mode of meaning before they are ready for the more complex type of language—that with words and a grammar in it—that we classify as a language in the adult sense.

After discussing the significance of the protolanguage, I then referred very briefly to the early years of the mother tongue, just in order to be able to pose the question: how does the language that the child is going to meet with in school, the language of educational knowledge, differ from and relate to the language he has grown up with in the home and neighbourhood, the language of commonsense knowledge? Educational knowledge is traditionally presented in writing; so I looked rapidly at the difference between spoken and written language and suggested some features which might be characteristic of the written language children are likely to be faced with when they move into the 'disciplines'—the different domains into which our learning has come to be classified and which form the subjects of the school curriculum. For that purpose, we glanced at a short passage from a textbook in primary science.

Then, in the second lecture, I approached the topic from more or less the opposite end, starting with the notion of 'scientific English', the forms of discourse in which English scientific texts have come to be written throughout the growth and development of the natural sciences in European culture. I took the physical sciences because they have had a longer history, and they have tended to lead the way: both in influencing what is to be recognized as learning, as educational knowledge in the culture, and in developing the language, the forms of discourse in which that learning may be construed. I looked at four texts, in the fields of astronomy, optics and electricity, by writers whose work has been important in our cultural history and in transmitting, in fact creating, scientific knowledge: Chaucer, Newton, Joseph Priestley and James Clark Maxwell. It was possible to trace across the five centuries spanned by their work a rather continuous process of the development of scientific language: the evolution of favoured patterns of discourse, and the lexicogrammatical—particularly grammatical—resources that evolved to sustain them. In this process, they were not so much creating new patterns in the language but rather exploiting existing resources already present in the daily language, which were, however, brought into prominence and systematically adapted to the needs of a new genre. By 'systematically' I do not mean consciously: just as literary writers are as a rule not aware of the particular linguistic patterns they are creating, so also scientific writers are not aware of the special linguistic features of their own writings. Writers of literature, of course, tend to show distinct individual styles, whereas writers of science share more of the features in common. But we should not exaggerate this difference. As Josephine Miles showed in her important work on 'Eras in English poetry' some twenty years ago, there are significant grammatical features that are characteristic of poetic discourse as such, and these tend to change from one period to the next, whereas within one given period, they are found generally in the work of all the writers in the tradition. And on the other hand, we can also recognize the individual characteristics of writers in the scientific tradition. But the general

tendencies are clearly there. And the point to be emphasized is that these are **not** the product of **conscious** effort and planning; the writers are not aware of them, and do not become aware of them, because they are features of the hidden grammar of the language—what Whorf referred to as 'cryptotypes'—that are revealed only by rather painstaking grammatical analysis.)

When one carries out such an analysis, it reveals a number of interesting features, of which I identified one particular set—one grammatical syndrome, so to speak—as being in my view especially significant. This was the pattern, emerging over the past 600 years, whereby in scientific writing, most of the lexical content is tied up in nominal structures of some kind or other (nouns, nominal groups with embedded phrases and clauses, or nominalizations); each of these nominal structures refers to some kind of process (in the broad sense of the term—action, event and so on), while the verb refers to the logical relationship **between** the processes: the two are being said to be identical with or similar to each other, or one following another, one causing the other and so on. This I interpreted as a form of metaphor, but grammatical metaphor rather than the word-based metaphor of traditional rhetoric, and I suggested that the emergence of technical terminologies is not primarily a matter of introducing new words into the language but rather is one of the effects of this overall evolutionary trend.

These developments in scientific language are not arbitrary, nor are they motivated by surface considerations such as making things shorter or tidier. They are very deeply motivated, by the need to present scientific content in such a way that its textual organization, its structure as information, should be clear and dynamic. A scientific language is not only a tool for communicating with; it is a tool for thinking with, a way of knowing and of extending knowledge. The presence of these structures makes it possible to develop and sustain an ongoing logical argument, by making explicit exactly what is functioning as background in any one step, serving as point of departure; and exactly what is functioning as foreground, as the main item of news, of new information. So when Priestley writes, following Text 2.5 above:

> *This difficulty in entering is supposed to be owing, chiefly, to the air on the surface of bodies…*

the principles of English grammar mark off the first element *this difficulty in entering* as the Theme, the point of departure, and the last element *the air on the surface of bodies* as (at least in the typical instance) the New information; so that this forms one step in a reasoned sequence of steps. Process no. 1 is:

> *'the fluid finds it hard to get in'*

You are not being told that as news, but as what is being taken for granted (as a matter of fact, we have been told it in the preceding paragraph) so that we can now proceed to move to the next step, which in this instance is to consider possible explanations of it. It is supposed to be owing—and now comes process no. 2—to the fact that

'bodies have air on their surfaces'

Now you may be being expected to know this too, or to assume it, since it has been packaged up in this way; but what you are being told to **attend to**, and may not know, is that it is in this instance functioning as a cause.

As a structure of argument, a way of using language to carry forward a chain of observation and reasoning, this is, as I said, both clear and dynamic: it gives an explicit status to each component, and it has a natural momentum, since each step contains possible resources for taking further steps to follow it up. But, as I suggested at the end of my talk, there are no free lunches; there is always a price to be paid, and here, we can see exactly what the price is. The textual structure may be clear and dynamic; but the ideational structure, the way the language gives an account of experience, is static and obscure: static, because of this metaphorical device whereby all processes are dressed up as nouns, which have essentially evolved to serve as names of things; and obscure, or at best ambiguous, because in the process of nominalizing, the relations among the parts of the process get left out. For example, just now I reworded *the air on the surface of bodies* as 'bodies have air on their surfaces'; but it may not mean that—it might mean 'bodies have a certain kind of air on their surfaces' and that, in fact, is what it does mean, only with the nominal group structure you cannot tell. Similarly in the example I quoted previously, from an intermediate science textbook:

Lung cancer death rates are associated with increased smoking

What does *lung cancer death rates* **mean**? Does it mean how many people die of lung cancer (and if so, in absolute numbers? as a proportion of all those who die?); or does it mean how soon they die? or how fast they die? And does *increased smoking* mean more people smoke, or people smoke more, or more people smoke more? Structures of this kind are in fact highly ambiguous. Putting the point in terms of a general linguistic theory, we can say that in discourse which displays this particular set of features, there is a gain in textual information but a corresponding loss in ideational information.

I shall come back to this question about the ambiguity of educational discourse in lecture 5, but for now, I want to put that aspect of it aside in order to consider another question, namely given the origins of children's language, as we saw it, from the protolanguage onwards, in the family and the peer group, how do children move into the forms of discourse they meet in school, where by the time they are ready to leave primary school they are expected to be able to cope with clauses such as:

lung cancer death rates are associated with increased smoking
light might affect the growth of all plant shoots
braking distance increases more rapidly at high speeds

And in particular, what are the resources they have in their own early development of language, which they can draw on when they come to use language for learning in school?

I will address this question in two parts. First, I would like to look at some of the semantic strategies that children develop in their early years in using the mother tongue—strategies whereby they are using language to learn, so I shall focus on the ideational function, that of language to think with, although we should make it clear that learning involves all the functions of language. Then, I shall suggest a general interpretation of their early learning experience, taking, as always, **language** development rather than cognitive development as the main conceptual framework.

Those who have observed individual children in detail throughout the period of the transition from their protolanguage into the mother tongue have all noted a particular phenomenon: that the children use, as a primary strategy for constructing language in the adult sense, the distinction that I referred to between language for doing and language for thinking. Now, it is the basic principle of adult grammars that everything we say embodies both these kinds of meaning. That is what grammar is for: to enable the two to be realized together. To put this in grammatical terms, every clause selects both in transitivity (ideational) and in mood (interpersonal). So for example if I say

Where can I buy a ticket?

I am at one and the same time using language in these two modes of meaning: (1) to construe my experience of the world—selecting a material process *buy* with an Actor (the buyer—me) and a goal (the thing bought—ticket), and also a location for this process (somewhere)—and (2) to interact with someone else, by asking them a question, signalled by the interrogative *where*, and thus requiring that they should supply an answer. In other words, the clause is **both** ideational (it is about something) **and** interpersonal (it is doing something). That is a general feature of adult language; it is not the case that some clauses are of one kind and some are of the other kind. With a few trivial exceptions, all clauses are both. But this is a rather complex state of affairs, to be meaning in those two different modes at one and the same time, and children have to work their way into it (and work hard at it!). They start to do this by separating out these two functions, so that whatever they say is **either** just a way of doing something—it has a pragmatic function, like asking for more food, **or** just a way of understanding something, commenting on what is around in order to interpret it, like seeing a red bus and saying *red bus*. Clare Painter notes about her son Hal at this stage that most of the words he used could occur in only one of these two functions, not in both. Since in the adult language, the two always co-occur, there is no way of expressing the distinction between them; so children invent their own, typically using voice quality or intonation. Thus, Jane Oldenburg found with Alison that her pragmatic utterances, meaning 'do something!', had a creaky voice quality; Hal, like Nigel, used intonation, though not the identical tone contrasts. What is common to all the children observed is that the 'doing' utterances are always the marked variants: it is as if the child felt that demanding a response of some kind was an additional semantic feature that needed to be clearly signalled as such.

So as children begin to learn their mother tongue, they develop from the start the clear sense that language has these two functions. (In fact, this is simply a continuation of the meaning potential of the protolanguage (see Fig. 3.1), but now it is

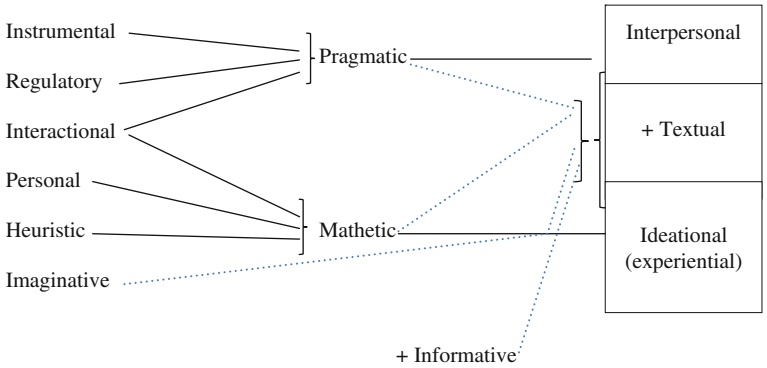

Fig. 3.1 Continuation of the meaning potential of the protolanguage

coded in a systematic way.) And one of these functions, the one we need to pursue here, is that of making sense of their experience—which is, after all, the foundation of scientific enquiry. When Nigel says at 1; 8

Ball go under càr

recalling something that happened earlier in the day, he is using the grammar of English to construe an experience, to sort out a complex event into its component features: a process, *go*, a participant in that process, the object *ball*, and a circumstantial element, in this case a place, *under car*—itself involving another object the *car* and an indication, *under*, of the relation between the two.

The grammar is thus a primary resource for learning. Now Joy Phillips, a specialist in English as a second language, wanted to explore the developmental origins of this resource; so she made a detailed study of Nigel's language from 1½ to 2½ years of age and was able to show how Nigel developed the semantic patterns for **comparing** and **contrasting** things and how he first recognized the similarities and differences between different experiences; this recognition being at the basis of all scientific endeavour (Phillips 1985). She described these two basic learning strategies in an interesting and thoughtful publication. Joy Phillips tried very hard to find some other source of material, a record of other children that was full enough to provide the necessary data, but she could not find one. Both comparison and contrast, she says, involve a degree of partial likeness: that is, some similarity and some dissimilarity. In comparison, you are foregrounding similarity, against a background of difference; in contrast, you are foregrounding difference, against a background of similarity. So when Nigel says, stretching out a long lock of his mother's hair (1; 9)

Mummy hair like ràilway line

he is comparing: her hair is not a railway line, so the background is one of difference; but given that difference, there is a similarity between the two. On the other hand, when he says (1; 8)

One blūe train one rèd train

he is contrasting: both are trains, so the background is one of likeness; but there is a difference, in this case one of colour.

Joy Phillips identifies in Nigel's speech six distinct semantic strategies, four for comparison and two for contrast. The six are as follows: *sameness*, *similarity*, *quality with reference to a norm*, and *quantity with reference to a norm*—these four are types of comparison; and then *oppositeness* and *difference*, as the two types of contrast. I will leave out the two middle categories and refer just to sameness, similarity, opposition and difference, showing how she traces the development of Nigel's meaning potential in these areas, over this twelve-month period, 1½–2½.

Text 3.1

(1) **SAMENESS**

1; 6	anòther…
1; 7	two bòok…
1; 8	got nòse… dada got nòse… mummy got nòse… anna got nòse…
1; 9–11	that book hèavy… that typewriter hèavy… it go very wéll on the cárpet … it go very wéll up the wáll…
2; 0–3	This train is at the stàtion and this train is at the station toò.

(2) **SIMILARITY**

1; 9	mummy hair like ràilway line…
1; 11	you (= 'I') walk on the wall like a lìon…
2; 0–3	No the lamp was not broken, like the lamp we saw in the pond The … the swimming thing that's like a piece of string. (= a floating buoy).

(3) **OPPOSITION**

1; 8	big bàll… little bàll… that bròke (= broken)… that not bròke. not thàt one… thàt one… [fitting shapes into holes]
1; 9	that tree got leaf on but that tree got no leàf on…
1; 11	there no bùmblebee in this train. there was a bumblebee in the wĕt train…
2; 4	Yes, if it's got thĭs it could go over the brìdge. But if it hasn't got thăt it'll have to go ùnder the brìdge. [pushing toy trains around track]

(4) **DIFFERENCE**

1; 7	blue pèg… green pèg…
1; 8	put bemax down on táble! [Mother: It is on the table.]—Nígel table!
1; 9	you're (= 'I'm') not having stewed àpple, you're having blàckcurrant…
1; 10	first Daddy finish talking then go in párk…
2; 1	Well you should have put the puzzle bàck; thèn you could have had that crane.
2; 2	That telephone in your new hòuse rings; but that telephone where you were sitting on the shòp didn't ring.
2; 3	If you make it fall on the floŏr how will Daddy be able to cùt it?
2; 4	The lady had to go out of the car to pick the dog ùp because she thought the dog was lòst; but she wàsn't.

(1) For **sameness**, at 18 months, Nigel has only one resource: the word *another*, applied to a second object of the same class—e.g. tongues, record sleeves and trains. (This is perhaps the most important single step in human learning!) At 19 months, he could use the word *two* in an appropriate manner: *two books*,

two lorries, *two pencils* and so on. And this brought to light a problem. He had a toy railway engine and a toy bus, which he had placed nose to tail on the floor. He looked at the construction thoughtfully. 'Two … two chuffa (trains)' he tried. But it did not satisfy him, 'Two … two …'—but the problem was beyond him, and he gave up. He had been defeated by the English language, which has no word for wheeled vehicle. (If he had been speaking Chinese, or Malay, all would have been well; he could have just used 車 or kěreta!) At 20 months, he began to use the strategy of repeating the same word: *got nose. Dada got nose. Mummy got nose. Anna got nose*—recognizing that all these different appendages belong to the same class, that of noses; and by 23 months, he added various other devices, *and*, *with*, *all*, *both*, *a lot of*, and was able to compare whole clauses, e.g. *that book heavy*, *that typewriter heavy*; *it go very wéll on the cárpet*, *it go very wéll up the wall*. By 2¼ years, he could show sameness: *this train is at the stàtion and this train is at the station toò*.

(2) For expressions of **similarity**, Nigel begins at 21 months with *like*: *mummy hair like railway line*; then at 23 months, the more complex form *you walked on the wall like a lion*. From age 2, expressions with *like* were used for reasoning with and also for seeking new words: *no the lamp was not broken ... like the lamp we saw ... in the pond*; *the ... the ... the swimming thing that's like a piece of string* (a floating buoy).

(3) For expressions of **contrast**, Phillips makes the parallel distinction between **opposition** and **difference**. At 20 months, Nigel was making lexical oppositions, e.g. *big bàll*, *little bàll*; and using polarity, e.g. (of two matchsticks) *that bròke (= broken) that not bròke*; or (when trying to fit shapes into a pattern) *not thàt one. thàt one*. This combination of polarity and antonymy remained the basic strategy throughout this period: (21 months). *that tree got leaf on but that tree got no leàf on*; (23 months). *there no bùmblebee in this train. there was a bumblebee in the wĕt train*. Then after age 2 (2; 4), he learns to make contrasts in the form of a hypothetical difference with contrasting consequences: *Yes if its got thĩs it could go over the brìdge. But if it hasn't got thãt it'll have to go ùnder the brìdge*.

(4) For **difference**, she recognizes a great variety of strategies: for recognizing different persons and objects, different attributes, different processes, different circumstances, differences of condition, of time, and between real and hypothetical time. Nigel begins at 19 months by recognizing differences of colour: *blue peg*, *green peg*; 20 months: *put bemax down on táble* (It is on the table)—*Níla table*! (that one, unusually, in a pragmatic context); 21 months: *you're* (= I'm) *not having stewed apple, you're having blackcurrant* (both kinds of fruit); and 22 months: *first daddy finish talking then go in park* (two events differing in a time sequence). By age 2; 1, he tells himself what might have happened if he had acted differently: *Well you should have put the pùzzle back; thèn you could have had that cráne*; then at 2; 2 he uses a variety of contrastive strategies such as *The telephone in your new hòuse rings*; *but that telephone where you were sitting on the shòp didn't ring. If you make it fall on*

the floõr how will Daddy be able to cùt it? The lady had to go out of the car to pick the dog ùp because she thought the dog was lòst; but she wàsn't.

Thus by the age of two to two and a quarter, Nigel had developed a range of linguistic strategies for learning and reasoning about the world as he experienced it. I have had to quote these out of context, for reasons of time; but let me give one example with its relevant background, to show how these processes actually take place in a real-life situation. This is from 23 months.

> Nigel knew about zoos; he had been to one and had been particularly impressed with the lions. On this occasion, his mother and I were planning to take him to the aquarium. Nigel heard us discussing it, but he did not know what an aquarium was. This was how he reasoned it out: (*1; 11)*
>
> *We not going to see a rào (= lion). Vòpa (= fishes). There will be some wàter.*

In other words: it is not a zoo; but it is something of the same kind, not with lions but with fishes. So there must be some water for them to live in.

Now, I should make it clear that in following through the language development of one particular child, Joy Phillips is not concerned with that child as an individual, with any special features he might display. On the contrary, she is making precisely the opposite point: that Nigel's language development can be regarded as typical. Of course, in saying that we have to ask: typical of what population? To answer this, we would have to look at large-scale studies of language development in young children. Perhaps the most informative of such studies in English is that conducted by Gordon Wells at the University of Bristol. Having studied children in 128 families over a period of two years, this project found, naturally enough, a great variation in the rate in which children developed their first language, and also considerable variation in the order in which different features were learnt. When the question is asked what determines the different rates of development, the answers become extremely complex. Features of the learning **environment** that are clearly correlated with a faster rate of development are the education and occupation of the parents, the position of the child in the family, and the amount of talk that is exchanged with the child by those around. Clearly, there are also individual differences in intelligence and personality, although it is impossible to measure either of these without using language to do so, so these factors cannot be considered independent. Finally, there are simply individual differences in learning styles, which is just another way of saying that children do things in different ways, just as adults do, for no discernible reason except that that is the way they do them. So what we can say of Nigel is that he is typical of an eldest/only child in a family of high scores on the educational and occupational scales, who was talked to (and I would add listened to, which the researchers do not mention, but which I think is just as important), a very great deal.

However, the main reason Nigel appears to be learning particularly fast is the nature of the data collected, and this is why I have to use him here as a source of information for this part of my table (I shall be leaving him aside after a few more examples!) One of the problems that bedevils all linguistic research is this: that

because of the unconscious nature of language and language behaviour, it is very hard to study language experimentally: people behave very differently, and they behave much less effectively, in experimental situations when they are made conscious of what they are doing. Now *children* are *people*, and a child of five, say, put in a situation where language behaviour is being elicited from him will behave in a way more like the way he did **naturally** when he was two or three years old (we shall come back to this point in the context of language in school). For this reason, some early experimental studies report that children of five were unable to do certain things—to produce passives, for example, or to understand relative clauses—which in natural circumstances, these same children would have been able to do for years. The Bristol study was not done under experimental conditions and is not therefore subject to that margin of error. But it does have another limitation: it was time sampled and therefore cannot give either the ongoing picture of cumulative contexts of interaction in which language development typically takes place (e.g. Nigel's extended discourse on trains, which went on as a continuing text for months on end) or the full account of what it is that the child knows at any particular time, including as it does the background of all that has gone before. While therefore the Bristol study has a breadth of validity, in terms of the population studied, far greater than that of the handful of diary-type studies I have been referring to (it is in fact a first-class piece of research), nevertheless it is less useful for exploring the particular questions I am asking. To see how children are using their language to learn, in their natural environment in home and family, we have to have detailed, 'language diary' accounts in which the full significance of what the child is saying at any one moment can be understood and made apparent.

One of the problems associated with sampling, or indeed with any outsider approach, is that of understanding what has been observed. For example, at age 2; 3 Nigel was looking at his scrapbook, in which he stuck pictures that he liked, especially pictures of trains. One of the pictures was stuck in upside down.

Text 3.2

2; 3

'You (= I) stuck it wrong way up because it doesn't stìck
that wáy', said Nigel.

I looked puzzled.

'No the tràin is not wrong way úp', he explained.
'It's the pìcture that's wrong way up. The picture
won't fall off the scrãpbook'.

In other words, you might think the train would fall off the rails, but it would not, because the train is really right way up. The picture is wrong way up, but that does not make the picture fall off the scrapbook. And I stuck the picture wrong way up because there was not room for it to go in right way up. I knew what this meant because I was an insider, with access to all the intertextual meanings that that exchange was drawing on.

Now, in a study of the development of syntax, in which one is simply interested in whether or not, and in what order, children have acquired certain syntactic patterns, it does not matter in the last resort whether the investigator understands the passage or not provided its structure can be identified. But in a study concerned with the development of the power to **mean**—semantic development—and with the extent to which children are able to use language as a means of learning, then it is essential to be able to understand what they are saying.

As if to show that he knew what happens when the train does fall off the track, Nigel then pointed to a picture of a train wreck in his 'old American steam train book'.

> 'Want Daddy to look at the train fallen off the bridge and want Daddy to say "poor train!"', he said.

We have seen therefore that by the time Nigel is 2½ years, he has a range of linguistic strategies for comparing and contrasting things. Here is Joy Phillips' summary of her findings, showing at what stage each of her major categories was reached:

Text 3.3: Sequence of appearance of categories of comparison and contrast (from Joy Phillips)

Category	Age				
	1; 6–7½	1; 7½–9	1; 9–10½	1; 10½–2:0	2; 0–2; 4
Same	object	process	attribute circumstance time		
COMPARISON					
Similar			object	process circumstance	
Opposite		attribute	object process	circumstance	condition
CONTRAST					
Different		object attribute	circumstance time		condition real/ hypothetical

Other children may take longer—or shorter—to get there; but they will have all these strategies at an early stage, well before going to school—and these are strategies that are obviously essential if a child is to succeed in the domains of educational learning. You must be able to construe the fact that two things can be the same, similar, different or opposite. Those are perhaps the most fundamental of all the semantic operations you need to control. But there are obviously many others, more specific and more complex than these, which need to be followed through; we cannot hope to cover these here. But I would like to illustrate just one or two of them; so before moving to the general part of the discussion, I will ask you to look with me at just two further examples of Nigel's discourse (Texts 3.4, 3.5).

Nigel has been thinking about the conservation of matter under transformation—that is, he has been making a piece of plasticine into various different shapes. He asks:

Text 3.4

4; 11

Nigel:	Why does as plasticine gets longer it gets thìnner?
Father:	That's a very good question. Why does it?
Nigel:	Because more of it is getting used ùp.
Father:	Well—[looks doubtful]
Nigel:	Because more of it is getting used up to make it lònger, thàt's whý; and so it goes thìnner.

If you had been experimentally investigating Nigel's ability to control the formal operation of conservation, he would certainly have failed the test. But it is clear from this passage not only **that** he understands it but also, more important for our purposes, **how** he understands it. It is not of course expressed in the language of scientific discourse, but it is clear, sensible and sufficiently general to be used to reason with on other occasions.

Then, proceeded by various astronomical discussions, in the course of which Nigel established (at 4; 11) that the stars and the moon were spherical:

Text 3.5

4; 11

Nigel	Do the stărs, and the mŏon, look sìdeways tó you (= at you) or do they look ùpwards, like a ròcket?
Father	Well, they haven't got any sideways. They're round.
Nigel	Oh! ĩ thought they were like a cìrcle. They're like a bàll!

a few months later, he said:

5; 4

Nigel:	Shall I tell you why the North Star stays stíll?
Father:	Yes; do.
Nigel:	Because thãt's where the màgnet is, and it gets attràcted by the eàrth. But the õther stars dŏn't, so thẽy move aròund.

Here the reasoning is based on impeccable adultlike logic. It is clear that Nigel takes 'moving, as the norm: why does *a* not do *x*?—because *a* has property *y*. But *b* does not have property *y*; so *b* does do *x*. (You may not accept the cosmology, but the argument is extremely sound.)

And finally—in relation to a very different point to come: two short exchanges in which Nigel is asking the **meanings of words**—something showing the **limitations** of his language:

Text 3.6

(1)	A friend:	Do you know what gave me the clue that you had come on the bike?
		—What does clùe mean?
(2)	Nigel has told his mother a long story about a double decker bus.	
	Mother:	Those are very interesting observations
		—[to me] What did she meàn by observations?
		There are no double decker observation cõaches.

Gordon Wells' studies, and many others undertaken over the past fifteen years, have filled in for us a fairly detailed account of what children know of the grammar of their language before they enter primary school, and the variation that we can expect to find across a typical population (Wells 1981). It is a very different picture from the one that teachers used to have, in some countries at least: that children really knew no language at all until they came to school to learn. This view arose of course because it was assumed (as it characteristically is in literate communities) that the only real language was **written** language, so that even if children did achieve fluency in spoken language, this had no real value as a resource with which they could learn. This attitude imposes a very great gap between educational knowledge and the knowledge that comes from everyday experience.

Today, I think it would be generally accepted that the children's preschool experience of spoken language is a fundamental part of their overall development and that education in school, despite the fact that it is inevitably different in significant ways from experience outside the school, is nevertheless a continuation of what has taken place already. This is made more obvious by the new patterns of living, whereby instead of a very sudden transition at age 5 or 6 from a highly unstructured home environment to a very formal structure of a school classroom, on the one hand, the distance between home and school has narrowed—schools have become less formal, and homes have become more structured—and on the other hand, there are now a number of intermediate, transitional institutions such as childcare centres, preschools and kindergartens where the demands on language are also in a sense intermediate between those of the home and those of the school. All of these contribute to the language background of the children, the primary resource they bring to the task of becoming educated.

Despite the quantity, and the quality, of developmental linguistic research, however, there is still a great deal we do not know about this aspect of children's language ability: that is, of how far their preschool language is functional in relation to the demands of educational knowledge. Clearly from this point of view, it is the semantic potential we are interested in, and while this is clearly related to what they can do syntactically, since they do not control the meanings if they do not control the lexicogrammatical resources through which the meanings are realized, the two are not the same thing, since they may not be **using** their syntactic resources in the adultlike manner demanded, for example, by the science lesson. Nor that the researchers have ignored the functions of the children's language: the Bristol project already referred to, and numerous researchers in children's conversation, such as John Dore, Ronald Scollon and Michael McTear, have studied extensively

some of the functional characteristics of children's speech (Dore 1979; Scollon 1976; Lock 1978). Wells, for example, recognizes seven major functional categories: control, expressive, representational, tutorial/social, procedural, interpersonal and responding, with numerous intersecting subcategories included under each—a total of about 40 functions altogether. But these are functions in the sense of speech functions, such as indirect request, warning, express attitude, explanation, imitation of model, disagreement and so on: functions in the rhetorical sense, so that the semantic significance behind them is that of language as doing rather than language as thinking. We need to supplement these with an ideational semantics such as that embodied in Joy Phillips' study of the Nigel data, where she asks how the child is able to use language for making comparisons and contrasts.

By using a functional meaning-based grammar, but focusing on the ideational rather than the interpersonal meanings, we can perhaps suggest some general linguistic principles on which their learning abilities must be founded. I will outline seven of these today. The remainder—those which relate rather to the next stage of learning, after the child has entered school—will be addressed in subsequent lectures.

1. There is a basic distinction between non-symbolic and symbolic action: between acting on objects and exchanging meanings with other people. Symbolic action—that is, the exchange of meanings—takes place in **language**. Language has two primary functions: acting (exchanging goods and services) and reflecting (thinking; exchanging information). Among the functions to which this exchange of meanings can be applied is that of exchanging **information**: telling other people, and getting other people to tell you, about the nature of experience. That is the first thing a child has to learn. All researchers have noticed that it takes time for children to go the whole way with it: to understand that language is not just a **symbol** of shared knowledge but an alternative to it—not only can you use it to tell someone something they already know (they experienced it too); you can also use it to tell them something they did not know—to construe the experience for them.
2. A **language** (as distinct from a protolanguage) is based on grammar: that is, a purely abstract code consisting of words in structures. However, the grammar is largely **iconic**: that is to say, it is not arbitrary, but naturally related to the perception of experience. For example, a clause is the representation of some process, in the real world or in the world of human consciousness; every clause is composed of a configuration of functions, such as Actor (Medium)—Process—Location, as in *the moon is shining in the* sky. Thus, the grammar provides a theory of experience, a way of understanding what goes on. (I shall have more to say about grammar as a theory of experience on another occasion; it is one of the fundamental concepts of linguistics.)
3. Part of the grammar consists of words: a vocabulary. Words have various properties, two of which are particularly significant. First, some of them **refer**: they stand for phenomena of experience, and those that do so refer in one of two ways: what the old grammarians called 'proper' and 'common'. 'Proper' words,

which are mainly nouns, refer to a given individual: typically a person or place. These are the type of word that children usually learn first—the names of the people around them: *Mummy*, *Daddy* and so on. 'Common' words refer to **classes**: classes of objects, processes, properties and the like. Children have no difficulty in understanding the **principle** of referring to a class—otherwise, they could never move out of the protolanguage. They have to learn of course what are the exact **boundaries** of each class: what is a *house* or a *room*; what is a *dress*, a *shirt* and a *coat*; what is *green* or *blue*; and what is *running*, *hopping*, *jumping* and the like; but the idea of class reference is no problem to them. Secondly—and this of course is fundamental for scientific thinking—some classes include other classes: common words are arranged in taxonomies. So *dress*, *shirt* and *coat* are all kinds of *clothes*; crayons that are *green*, *blue*, *yellow,* etc., are *coloured*; *running*, *hopping* and *jumping* are all kinds of *going*, or *moving*. (They often discuss these questions, e.g. Nigel at 2; 3: Father: *We had to throw it away, like the balloon, which broke*. Nigel: *No it dìdn't bróke; it bùrst*.) Nigel had of course grasped this principle already, when he was counting his wheeled vehicles; unfortunately at that point, the language let him down. So they learn that an important part of the grammar of any language consists in class names arranged in taxonomies.

4. The other part of the grammar consists in configurations, and these configurations are iconic, as I mentioned a moment ago. But there is a further point to add to this: there is always more than one configuration simultaneously. To explore, this would take us quite a way into the technicalities of grammar; yet it is something children have typically mastered by the time they are two, once they have made the transition from protolanguage to mother tongue (as described by Clare Painter in her excellent book *Into the Mother Tongue*). Thus, as well as being structured as a **process**, a representation of experience, a clause such as 'the moon was shining in the sky' is also structured as a **proposition**, as a giving of information, with subject, finite, predicator and adjunct, and thirdly as a **message**, with a theme *the moon* as its point of departure. The child who is speaking a form of any adult language has mastered the principle that all communication, and all construction of experience, involves these three basic semantic components, the ideational, the interpersonal and the textual. This again is something that should perhaps be underlined, because all of us, educators—and textbook writers—tend to operate as if learning was a purely ideational matter. But the grammar tells us—another aspect of grammar as a theory of experience—that all interpretation, all understanding, is also a form of doing, involves interaction between people. In Lemke's terms, discussing science education, all thematic systems imply some activity structures.

Up to this point, we are well within the limits of what the child can do by the time he comes to school, or even to preschool. (Notice that it requires a complex and technical theory of language to enable us to bring to consciousness things we have known unconsciously since we were tiny children—though we should not perhaps be too surprised at this; after all, we can all walk, but how many of

us can explain the physiological processes that walking involves?) Now I want to jump forward to something that goes well beyond the abilities of a two year old and is still at the threshold of learning by the time the child is getting ready for school. This is the concept of the **abstract**.

5. We must be careful to distinguish the notions of 'abstract' and 'general'. Word taxonomies are based on the principle of generalization, the relation of general/specific: so *clothes* is more general than *shirt*, *dress* or *coat*; *coat*, in turn, is more general than *jacket*, *raincoat* and *overcoat* (at least in British English). But all of these are equally concrete. My *clothes* are just as concrete as my *shirt*; similarly, a palm tree is a kind of tree, but tree is no less concrete than palm tree; it is just more general. Now, as we have said, children have no difficulty with general terms. They do, however, take longer to understand those that are abstract: that is, they have no concrete, identifiable object, property or process to which they refer.

   This was the point I was illustrating with the final examples from Nigel. At age 4–5, he was still having difficulty with abstract terms; so the only sense he could make of *observation* was one which was familiar to him, namely the observation coach at the back of a train. Similarly *barrier* he understood only in the sense of a barrier across the road at a crossing point, and he could not grasp the meaning of the word *clue* used by the visitor in speaking to him.

   It seems that 'education' traditionally began at the time when children were beginning to be able to cope with words for abstract concepts. This makes very good sense, in view of what I was saying in the first lecture about education beginning with the move into the written forms of language. In order to read and write, it is necessary to understand abstract forms of meaning. A written symbol is itself a highly abstract object. Whether Chinese character, or letter of the Latin alphabet (as used in English, or in Malay), it has no concrete referent. But more than that, the terms that teachers use to talk about writing are also highly abstract. They talk about the beginning and the end of a word, about the difference between writing and drawing and about ideas and complete sentences and letters 'saying' (the child will never hear a letter talk). So children have to operate with this highly abstract discourse in order to succeed.

   There is nothing inappropriate about this; it is a natural step in language development. But unlike other principles referred to so far, which are mastered very early, the principle of abstract names takes somewhat longer, and we want to be able to recognize if a child is having difficulties which arise from being unfamiliar with the abstract mode of naming things.

   Finally, however, in between these two stages, the beginning of the mother tongue and the time just before going to school, we have been able to recognize some important steps in learning in the form of the kinds of semantic strategy that I was illustrating, from Joy Phillips' work in particular. These illustrations fall under two broad headings.

6. Recognition of **partial likeness**. This principle we can now see is already embodied in the way the 'common' words of the language are interrelated. For example, a shirt is not the same thing as a dress; but it is like a dress—they are both things you wear, and this likeness is explicitly embodied in the **word** *clothes*. The vocabulary is organized into sets; this was why Nigel was puzzled not to find a superordinate term for things so obviously alike as buses and trains. We have seen that, in addition to their vocabulary, children build up various grammatical strategies for organizing their experience around same or opposite, and similar or different. These are concepts the teacher can normally take for granted and build upon. Spoken languages have a rich array of lexicogrammatical resources for expressing them, and they constitute a powerful tool for exploring reality in an educational, including science education, context.
7 Recognition of **logical–semantic relations**. Similarly, children of preschool age can also operate with relationships between **processes**, in terms not only of partial likeness but also of time (before, after, simultaneous), cause (purpose, result) and condition (if, although), as well as of course simple co-occurrence and counter-expectancy (and, but). All of these we saw in Phillips' account, and they have been studied in various forms of experimental design. Children can also assign to what they are saying various degrees of probability and usuality: things **may** happen, **sometimes** happen, all the various intermediate points between *is* and *isn't*, *do* and *don't*, as well as, of course, the positive and negative polarities themselves. This area, polarity (yes/no) and modality (maybe; sometimes) are one of the ones that I have not been able to take the time to illustrate.

So although there is still a big gap between the language of the five year old and the kinds of scientific discourse he will meet in the course of his education, as little Lewis, Chaucer's son, was to meet with at the age of ten, I think it is also true that natural languages in their homely, common-sense forms do contain the basis for a systematic exploration of our experience of the world we live in. Despite the dissatisfaction that scientists have expressed with the languages with which they have to work, I do not believe there is a *real* discontinuity between our everyday common-sense understanding of phenomena and the theories that we have about these phenomena as a result of some centuries of scientific research. But to show the continuity, we have to focus on the language, since it is in language, and particularly in grammar, that we find the core of the interpretation that is common to both. It is in fact a major challenge to present-day linguistics that we should be able to bring this out.

Meantime, I hope to have suggested here that we should take seriously both the achievements and the difficulties children have in their early experience of using language to learn. I have tried where possible to draw on my own experience, not only as a linguist but also as a teacher—and also—and not just in studying my son's language!—as a parent, since the understanding of language and learning involves all three. As a next step, I shall try to take the account one stage further, and consider language and learning in the context of the school, concentrating particularly on the primary level for the major part of the discussion.

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Chapter 4
Language and Learning in the Primary School

We have now mounted a three-pronged attack on the question of language in the primary school: via the concept of educational knowledge, as coded in the written language of school textbooks; via the history of disciplinary discourse, in our survey of the evolution of scientific English; and via the semantics of language development in early childhood, beginning with the protolanguage and then exploring those aspects of the child's preschool grammar and semantics that seem central to the ability to use language in the interpretation of experience.

This provides a context within which to raise issues concerned with language education. It seems to me, referring back of the discussion under those previous headings, that the relevant features of this context are something like the following. Children grow up, in all human cultures, surrounded by talk; this talk typically, in sufficiently many instances, relates to what is going on around them, so that by putting together the two components of their experience—the language events and the non-language events—children are able to construe the system, the code that lies behind the talk, and therefore to participate actively in it themselves. They cannot master all the adult code at once; so, they take in what they can process, and also—most importantly—what they are just **not** able to process, at any given stage, which they then use to extend their own language potential. What is too many steps ahead of the point that they have reached they just ignore. By the time children are ready to enter primary school, they understand the **nature** of the semiotic code (implicitly; they do not control this understanding at the conscious level); they understand its basic functions, as both a means of acting on the environment and a means of thinking about the environment (or, in another metaphor, exchanging goods-and-services or exchanging information); and they have mastered the fundamental semantic strategies of taxonomy, other forms of partial likeness (sameness, similarity, difference and opposition), the configurational structure of processes, and the logical relations of co-occurrence, counter-expectancy, time, cause and the like that obtain **between** processes. This mastery holds in relation to processes that are concrete, or else processes taking place in their own consciousness; the extension to abstract processes lies precisely at the kind of frontier of their understanding that I was just talking about. At the time, they come to enter

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school, children are working on these abstractions, so to speak; they are on their current agenda.

The second aspect of the relevant context is the historical one: There have been, by now, in the mainstream cultures of the world—the Chinese, the Indian, the Islamic, the Graeco-Roman—many centuries of institutionalized learning, in mathematics, science, philosophy, history, law and the like. For all of these, there have evolved particular forms of discourse, originally in a small number of classical languages: Sanskrit, Classical Chinese, Classical Arabic, Classical Greek and Latin, and more recently in the languages spoken today, of which English of course is one. Now, I think that it is not really possible to separate the forms of discourse from the subject matter; learning science **is** learning the language of science. Only, one thing that is usually ignored by those working in this area, if they are not starting out from linguistics, is that this language **must** be understood not only as **text**—a finite body of actual discourse, written and spoken—but also as **system**, a potential, itself infinite, that lies behind the text and to which any actual text stands as an instance. This is a theoretical point, but it is of critical importance: if educators come to recognize, as they very often do today, that in order to succeed, say in science, you must master the language of science, they need to bear in mind the fact that this implies mastering the system of that language. A learner cannot succeed in science if he can only expound the language of the textbook. He must know what constitutes the meaning potential of scientific **language**.

Our third aspect, then, is the educational one: the extent to which this institutionalized learning has been re-codified as educational knowledge turned into curricula and syllabuses and textbooks and school laboratory experiments and teacher talk. Where it has been, then each of these activities has evolved its own modes of discourse. The language of science textbooks is an obvious example; but, we should not forget that the teacher's science lesson, including the teacher' s talk (and the pupil's responses if any), the talk among the learners themselves, the laboratory instructions, all take place in language, and again, it is highly functional language, oriented towards this or that specific purpose. But not only these, there is also the language of the syllabus, of the various supporting documents put out by the Ministry or Department of Education, the public statements of the aims of education and so on; all these are part of the discourse of science education, even though some of them lie at many removes from the learner and are crouched in some bureaucratic or utopian register rather than in anything we would recognize as scientific English.

At the intersection of all this, then, is the child coming up into the primary school (and I am using the term 'primary school' in its most general sense to mean the institution, or institutions, where children learn from the stage of initial literacy—learning to read and write, age 5 or 6—to the point of transition to the secondary level around age 12: in other words, I am ignoring local variations on this scheme and talking simply in terms of a three-level process of primary, secondary and tertiary education). A child entering into primary school brings his own personal experience of language and learning, and confronts with this a body of educational practice that relates in turn to a tradition of learning and a body of cultural knowledge

that lie beyond the walls of the school. And all these varied components—the child's experiences, the school's beliefs and practices, and the scholarly traditions of the culture—are enshrined, and made explicit, in language.

Here I want to ask what happens when these come together, and I am posing the question as always in linguistic terms. Specifically, how do children in this situation go about learning the language, or languages, of the school and its various subjects, and how far in doing so do they make use of what they know already? I should like to consider this under four related headings:

(1) initial literacy—learning to read and write;
(2) styles and registers in the primary school;
(3) the beginnings of scientific discourse; and
(4) spoken and written language in education.

Let me take the question of initial literacy first.

(1) As I stressed in the first lecture, reading and writing is an extension, into a new medium, of what a child has already been doing for some time, namely speaking and listening; the most important fact about a child setting out to master a written language is that he already has a spoken one. But in order to master the new medium, the child has to bring to consciousness experiences which he has meanwhile, in the process of learning to talk, stored at a much deeper level, below the level of conscious awareness, and although in our adult terms, the timescale seems very short, just a year or two, in terms of the child's short life it is already quite a long time since he has been working hard at the grammar and pronunciation of the language. He worked hard at it precisely so that the whole process of listening and speaking would become **unconscious** (like walking), because on that depended its success. Like many other forms of human behaviour, you **succeed** in languaging by **not** having to think about how you do it. There is therefore a real conflict between the demands of the old medium—speech—and the demands of the new one—writing. Some educators have maintained that it is possible for a child to learn to read and write without bringing language to consciousness; but although this may happen with some children, I don't myself think that it can happen that way with the majority. Most children inevitably become conscious of language, in one aspect or another (sounds, words or both), in the process of associating written symbols with what they already know, and indeed one reason children may fail in becoming literate is that they fail to make this connection at all, their spoken language remaining deeply immersed out of reach of their attention while they struggle to find **some** point of reference for the strange new visual symbols that confront them.

What we see very clearly, in the primary school, is the **consequence** of this process of becoming conscious of language. Text 4.1 is a transcript of a little bit of a conversation some six-year-olds were having with each other, and with their teacher, on the subject of dinosaurs. It was, as you can tell, an animated conversation in which their language was fluent and cogently argued.

Text 4.1

– They must have been like huge crocodiles—and fierce!
– Yeah. I wouldn't like to meet one in the dark!
– Yeah. But … they didn't live in the water, did they? I mean—some of the big ones did, but —
– Some of the big ones did. They had to; they couldn't stand up on land.
– Couldn't stand up? Don't be stupid! How could they grow big then?
– But they breathed; they had to have air. You could see that one in the picture: it had its nose sticking out of the water. Like a hippo, that they have in the zoo.
– So we could say 'Dinosaurs have cold blood. Some—'
– Had. Had, not have. There aren't any left.
– Yes, but that's if we were telling about them now. We're supposed to be in the past. We have to tell it as if we could see them.

There was a lot more of this, of course. Now looked at Text 4.2:

Text 4.2

I am a dinosaur.
I was born out of an egg.
Today I was hungry. I ate some leaves.

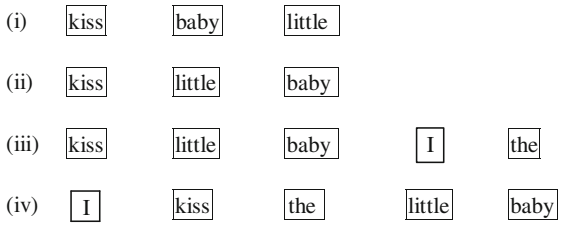
This is a written composition by one of those children on the same subject, after the discussion had taken place. It is 'stilted', you might say, if you were trying to characterize it. What does this mean? What you are noticing, I think, is that the child's developmental age has gone down by 2–3 years in the process of constructing a text in writing. He has regressed, so to speak, and is quite unable to capture the semantic complexity that he controls quite naturally in his speech. I referred to this phenomenon previously when discussing language development research: that if you put a child in a situation where he becomes conscious of language, and monitors what he is doing, then he typically performs at a level far below that at which he will perform when behaving naturally. And this is exactly what happens when a child is first learning to write. His writing is strikingly similar to the transcripts of the spoken language produced by children of that age group under experimental conditions. It is likely that this pattern is further reinforced, in many instances, when children are learning to read. In many of the traditional primary readers, they are faced with language so babyish that they could not possibly take it seriously—if it was not for the fact that the **process** of conning the written text, so as to read it, also takes those years off their linguistic age.

Text 4.3

1 You want fun
I want fun
This is fun
This is Pat
I like Pat
Pat likes fun
We like this dog

2 Come to my house said Jip the cat
Come to my house said Meg the hen
Come to my house said Sam the fox
(called 'A Visit' and ending up)
Come to my house, they all said.

But here the situation is even more complicated. Some educators have thought that the best solution would be to produce primary readers which were, or at least were based on, transcripts of natural speech; this they feel would give the children something more realistic, and therefore more meaningful to read. But this is not the answer. As we have seen, there are some real differences between spoken and written language, and to set children to reading the sort of discourse they are themselves using when they talk would in fact only baffle and confuse them. They reject it—just as infants reject it if you try and talk their own protolanguage back to them. The solution we adopted in *Breakthrough to Literary* was to have no primers at all, but to let the children build up their own corpus of reading material out of what they themselves wrote (Mackay et al. 1970). This could work because they were not in fact having to 'write', in the sense of having to wield a pencil and form letters. They were 'writing' in the sense of constructing written text, with the aid of a sentence maker and a word maker, where the words, or their constituent letters if a child had got that far, were printed out on cards, and what the child had to do was to fit these cards into a little stand so that they made sentences.
Now one thing that happens frequently with children using *Breakthrough* materials is that they go through certain stages in constructing sentences of written English. Here is an example described by Mackay, Thompson and Schaub:



This was typical of the stages the children went through. Now here you can see two processes going on side by side, one of which—though not the other—has a close analogue in spoken language development. (a) Getting things in the wrong order is purely a problem in handling the written medium; it is not typical of the learning of spoken language. (I have never heard—or heard of—an English-speaking child using a structure like *baby little* for *little baby* in speech). But (b) leaving out the grammatical words is a well-recognized stage in learning a language, one which a majority of children go through (most children perhaps except the perfectionist type, those who do not say a word till they have mastered the whole system). Children in fact have a natural insight

into the differences between grammatical and lexical items (function words and content words); at least they do in English, and presumably in other languages which make a similar distinction. Like Nigel, who was a good example of this, they go through a stage which used to be called 'telegraphese' (from the days when people sent telegrams). Now, in writing, with *Breakthrough*, some children might take ten minutes to get from stage (i) to stage (iv); while others would take ten weeks or ten months; but it was very common for a child to start by writing only the content words, and this was a strong indication that as a strategy for mastering the written language, the children were regressing to an earlier developmental phase. They can move on much more quickly of course if they are not having at the same time to struggle with the physical process of writing—that was the principle we were adopting, and for the same reason, children learning to read do not need to be faced with language that reaches back into their distant past. And this leads me on to the second point.

(2) Style and register in primary school writing. Jim Martin and Joan Rothery pointed out in 1980, in their study of the writing done by children in Australian primary schools, that the whole pattern of children's writing was onesidedly geared to **narrative** (Martin and Rothery 1980). The children typically *began* with simple **recounts**, such as 'I went to the zoo. I saw a crocodile. The crocodile was eating a chook'. From here they were then encouraged to progress to **narrative**. A **narrative** is different from a recount; it is a story with a point to it, so that it has some distinctive structure incorporating a complication and a resolution. The children reached the level of narrative, and there they stopped. As Martin and Rothery reported, after their subsequent research, out of **1500** pieces of writing which they collected from years 1–6 in Sydney schools, about 85 % were of the narrative or narrative/expressive kind (incorporating writers' feelings). Other kinds of writing—what they refer to as 'factual writing', including report, procedure, explanation and exposition, taken all together accounted for only 15 %. The teachers' response to all contexts in which writing was called for could be summed up as 'write a story'.

Now there is nothing wrong with writing stories; it can be fun, and it can be a useful educational experience. But there is a great deal wrong with turning **all** primary school writing tasks into story writing. This practice appears to go back ultimately to the romantic ethos, and the romantic view of childhood which is so pervasive in our Western educational philosophy. I bring it in here as illustration of, and introduction to, a more general point, which is this: as children go through primary school, they have to learn to use written language in many different contexts, and these contexts call for different registers, including all those referred to by Martin and Rothery—narrative, expressive, reporting, procedural, explanatory and at least one kind of expository. The school should be able to develop this range of choice rather than narrowing it down.

How do these various kinds of writing differ from each other? They differ first and foremost in their rhetorical structure. Let me draw on the account given by

Martin and Rothery. A narrative will usually have the following distinct steps in it: '(1) Orientation, which introduces participants and says something about where and when; (2) Complication, a sequence of actions leading up to a crisis; (3) Resolution, in which the crisis is solved; and often also (4) a Coda, commenting on the story as a whole' (Fact, Writ. p. 86). Expository texts, on the other hand, are made up of Thesis and Argument(s) and Conclusion: the Thesis 'presents the proposition to be argued'; in the Arguments, of which there may be any number, the writer depends or raises objections to the Thesis; the Conclusion is, of course, the conclusion (Rothery 1989). Each of these varieties, as Joan Rothery says, 'is structured to achieve its goal'. Thus, the goal of expository writing is to persuade the reader, either that something **is** so (analytical exposition) or that something **ought** to be so (hortatory exposition). This explains the way such writing is organized.

(3) Now we can pass to our third point, which is the beginnings of scientific discourse in the primary school. Let us ask the question: what then is the appropriate form of writing for learning science at this stage? Not expository: you are not trying to persuade anybody of anything. Not narrative either; you are not telling a story for anyone's entertainment or edification. Yet teachers often fail to distinguish scientific writing from storytelling; not only in the very early years, when they will look for simple recounts like that of the crocodile example, but right up to the final year of primary school or even beyond. One instance that Joan Rothery found was of a pupil asked to write on the human digestive system, whose essay was entitled. 'I am a ham sandwich'—telling a story in which he imagined himself to be a ham sandwich as it passed through the various processes of being chewed up, swallowed and digested (in our department, we now refer to this practice as the 'I am a ham sandwich' theory of education). It is obviously not narrative that is the appropriate form of writing here, but that which is known as ***report***.

Now a Report typically consists of just two functional elements: General Classification, followed by Description—although, as with the Arguments in an expository text, the Description may consist of any number of parts. Here is a Report text from a Year 2 child in a Sydney primary school:

Text 4.4

The Bat

The bat is a nocturnal animal. It lives in the dark. There are long nosed bats and mouse eared bats also lettuce winged bats. Bats hunt at night. They sleep in the day and are very shy.

The bat is a nocturnal animal.

'This is the General Classification, in which the bat is classified as a type of animal. The remainder of the text is a description of types of bats and of their habits and characteristics:' (Rothery, ibid)

It lives in the dark. There are long nosed bats and mouse eared bats also lettuce winged bats. Bats hunt at night. They sleep in the day and are very shy.

Simple, of course; especially by comparison with what that child would have told us about bats in speaking. But, as Joan Rothery comments, 'even at this early stage of schooling the writer has mastered the structure of report-writing'. However, as we saw from the sample, this type is rather rare: only about one in ten. When Martin and Rothery came to look at the writing actually done in the course of primary science, they found a large number of stories (narrative), and also many texts of a kind they refer to as 'Observation Comment', for example:

Text 4.5

Clocks and swords

I like the Strasburg clock because it was a real clock and it was a good clock because it had the apostules were moving around. The roosters started yelling coca-doda-do.

This was written after the children had been to visit the Museum of Applied Arts and Sciences. Joan Rothery comments:

> [this] is a very common type amongst 'beginning writers'. In the first years of the infants' school young children commonly write observations regarding activities or events they have been involved in and comment about these in some way. We regard Observation Comment as an immature variety of writing. It does not occur in adult writing as a separate variety … But the writer of this text was in Year 6 when it was written. He was about to enter secondary school with its array of writing demands, mainly of a factual kind in subjects apart from English. (p. 75)

She contrasts this with a Report text from another student in the class, of which I give just one section.

Text 4.6

The Planetarium is a little room with a dome roof and a Planetarium Projector with lots of seats round the Projector. The way the projector works is it can show slides, photos of astronomy. The projector also shows the night sky with the stars, planets and moons of the planets. It can also move everything in the sky to where it would be in the sky. (p. 74)

One step that can be of value to children in primary school, therefore, is to help them to understand these three principles: (1) there are different **kinds** of writing; (2) that written texts are organized—they have a textual structure; (3) (the most important!) that the structure is suited to the purpose the texts are being written for. For each kind of activity, we can ask about the kind of text that is generally appropriate to it. So for primary science the most serviceable kind of writing is the Report, in which you introduce some topic in the form of a General Classification and then proceed to describe its relevant features. If the topic includes some experiment you have performed, you may want to put into the Report some account of that experiment; but this is a different kind of account from what is involved in telling a story.

(4) This takes me to my fourth heading, spoken and written language in education. Here again I will concentrate at least initially on the field of science education, as the main area of exploration and illustration; but I shall be looking at it, as always, from a linguistic point of view, and in a way that is relevant, I hope, to all aspects of learning in school.

Let us go back briefly to language in the home. Ruqaiya Hasan, in the large corpus of mother–child interaction that she and her co-workers have assembled, finds numerous instances of mothers instructing children in the mysteries of the natural environment—not setting out to teach them, but simply responding to their queries and their anxieties. For example, there is long passage in which Kristy, at 3½, is grieving over a dead moth; so her mother talks to her, in a passage that goes on for 135 clauses and is still unfinished when it is interrupted. Mother and Kristy are talking to each other in a dialogue, while the baby sister is hanging around in the kitchen. It is too long to quote in full; but it includes the following:

Text 4.7

M: Do you want to have a look at him?
C: Yeah.
M: Poor little moth.
C: Poor little moth. Poor little moth.
M: Do you want to put him on your hand?
C: Mmm.
M: There … what will we do with him?
C: Put him in there – em, leave him there.
M: OK, we'll leave him up on the side.
C: [sadly] I want him.
M: There'll be other moths. I guess he was happy when he was flying around, and now he's not anymore, is he?
C: No. [cries]
M: He can't hurt anymore either. I'm afraid little moths do that all the time.
C: Was that a baby one or a big one?
M: No. Moths are, em – [Banging noise; to Ruth] Hey don't bang the oven. Moths are quite old. When they're little, they're little worms; And … well, you know the book about the hungry caterpillar that you've got?
C: Yes.
M: He ate and ate until he became a big fat caterpillar.
C: Mm.
M: And then he built himself a cocoon, and then he came out of the cocoon. Then he was a butterfly. Well moths also come out of cocoons; but they … they only come out of their cocoons to lay their eggs, and after they lay their eggs, they die.
C: Why?
M: Well because they're very old by then. It's the end of their life when they come out of the cocoon, so if he hadn't died there, he would have died in a few days anyway.
C: Why did he fall into the hot water?
M: I don't know. But I guess he probably flew low over it, and with hot steam coming up from the water it might have made it hard for him to fly.

The text is highly structured—as a great deal of spontaneous discourse is. Note also—less obvious because we are less conscious of grammar—some of the grammatical structures the mother uses, e.g.

Well moths also come out of cocoons
but they only come out of their cocoons
to lay their eggs
and ...
after they lay their eggs
... they die

I don't know
but I guess
he probably flew low over it
and ...
with hot steam coming up from the water
... it might have made it hard for him to fly

These are quite complicated grammatical structures, the sort that are very characteristic of spontaneous speech in contexts of this kind. It recalls some of the structures found in early scientific writing, such as Chaucer and Newton, perhaps as far as Priestley. (But not so much the later writing in, for example, the Scientific American, which tends to have very simple sentences, and achieves its complexity in a very different way. This point we shall have to comeback to later on.)
Now Kristy will have had many such occasions in her life by the time she comes to school, and she will be able to use that kind of discourse to reason with, herself. I would like you to compare that kind of grammar with the grammar Nigel is using to reason with in this extract from his spoken language at age 7; 0:

Text 4.8

Nigel: How do you see what happened long agò, before you were bòrn?
Father: You read about it in books?
Nigel: Nó; use a mìcroscope to look back.
Father: How do you do that?
Nigel: Wèll: if you're in a cãr, or in an observãtion coach, you look bāck and then you see what happened befòre. And you need a mìcroscope to see what happened long agõ, because it's very far awày.

Newton might have objected to the conclusion, though Einstein probably would not; but both Newton and Einstein would have agreed that it is an excellent example of using language to think with, and to think with scientifically. (The problem for science teachers is not so much that children **ask** questions like 'how do you see what happened long ago?', but that they **stop** asking them—hence they are not on the agenda, not part of the discourse of educational knowledge.)
Now Nigel was just 7 when he asked that question; he was 5 when he talked about the North Star. Kristy was 3½ when she was discussing the life cycle of the moth. When they get to school, their knowledge has to be organized, compartmentalized and restructured, to fit it into the pattern of classification and

framing that I mentioned on the first occasion. So what happens? What happens is what we have already seen happening with the move into written language—the process has to begin by their regressing to an earlier stage. You remember the text about animals protecting themselves by colouring, by biting and stinging and so on. They know all that. But they have to relearn it in the context of a different semiotic system, using different kinds of discourse—and in particular, using discourse that is based on writing rather than speech. I don't mean that they don't learn anything new; of course they do. But most of what they are learning in primary science is the structure of knowledge itself, and also the **language** in which that knowledge is enshrined.
An example—since we have been talking about moths:

Text 4.9

In the years since 1850, more and more factories were built in northern England. The soot from the factory smokestacks gradually blackened the light-coloured stones and tree trunks.

Scientists continued to study the pepper moth during this time. They noticed the dark-coloured moth was becoming more common. By 1950, the dark moths were much more common than the light-coloured ones.

However, strong anti-pollution laws over the last twenty years have resulted in cleaner factories, cleaner countryside and an increase in the number of light-coloured pepper-moths.

Let us focus on the last paragraph:

Strong anti-pollution laws over the last twenty years have resulted in cleaner factories, cleaner countryside and an increase in the number of light-coloured pepper-moths

Note that this is highly metaphorical, in the sense of grammatical metaphor in which I am using the term, and that it follows exactly the pattern that we found emerging in the language of Newton, Priestley and Maxwell:

happening 1:	over the last 20 years people have been forbidden to pollute	<↘ nominal group >
happening 2:	factories have become cleaner	<↘ nominal group >
relation between the happenings: have resulted in		<↘ verbal group >

This is what we have now come to recognize as the typical metaphorical grammar of modern scientific English.
Now I want to return to this example later on, because it illustrates a number of points; but just let me pursue this question of grammatical metaphor first. Suppose you were explaining all this to a ten-year old child, whether as teacher or as parent, but in **talk** rather than in writing. How would you **say** it? Certainly

not as it is written. More like the way Kristy's mother talked to Kristy, though of course allowing for the difference in age—you might say something like:

During the last 20 years, the government have made strict laws, to stop people polluting the air. So now the factories have got cleaner.

But now I want to look at this example in a little more detail, if you will allow me, because it will serve to illustrate a cluster of related points. I shall make a general one first, then some more specific ones, and then return to the general point which I hope to be able to bring out rather more cogently.

I mentioned in the previous lecture, a particular feature of child language development which I think is highly significant for a linguistic theory of learning: namely, that while children have no problem with **generalization**, in that from the point where they begin to build a grammar, in the transition from protolanguage to language, they can understand the principle of 'common' words (that is, words referring to classes), and furthermore they can understand the taxonomic principle that some classes include other classes—they **do** take a few years to master the principle of **abstraction**, being in general not ready to process abstract terms until age around 4–5. So they master generalization (the relation of general to specific) first—note that there can be no language, in the sense of adult language, without it; but abstraction (the relation of abstract to concrete) some time later. I also introduced a third notion in this same general area, that of metaphor—but specifically in the sense of grammatical metaphor, the sense which is relevant here. I don't want to call the opposition 'metaphorical versus literal', because that will imply metaphorical in the wrong sense; so let me call it the relation of metaphorical to 'congruent'. In the course of children's learning (and I have stressed that all learning is a linguistic process), metaphor comes later still—well after the move into **abstract** discourse and usually not before age 9 or 10. Something highly metaphorical, like *anti-pollution laws have resulted in cleaner factories*, is difficult for 9-year-olds to grasp. They could con it, and work out what it meant; but to have it slipped in as a way of conveying this particular piece of information is likely to be quite unhelpful.

Now these are not isolated examples; they are occurring all the time. From a popular science book written for children around this same age I noticed the clause:

Tradition dictated the wiping of food with hands

Rewording this in a more congruent form, we might say something like: *people had to wipe their food with their hands because they had always done so before* (although actually it was not people, it was chimpanzees). It is rare to find a whole paragraph in a school science textbook without some grammatical metaphor, and many of the instances are of this particular kind, which as we saw last week is the most highly favoured clustering of metaphorical features: two processes, each turned into a noun, with the relation between the two expressed as a verb.

Now we were able to show, in looking at the development of scientific English, that this grammatical metaphor is clearly functional, and here we must examine the example in more detail. As used, for example, by Joseph Priestley, this kind

of metaphor enabled him to put at the beginning of the clause, as his Theme, a whole package of wording that summarized what had gone before and therefore could now be taken for granted, and used as a stepping-off point for some further information. Remember his nominal group.

the mutual repulsion of the particles of the fluid

which he used thematically, having told us in the previous paragraph (but one, I think) that the particles of the fluid repel each other. But here in the present text we have had no previous mention of any anti-pollution laws; this is the first time we have heard of them. The reader has not only to ride the metaphor but also to recognize that despite its being used as the theme in the clause, a point of departure for some other information, it is not in fact information he had already had. You are being told about these laws for the first time.

But there is worse to come. Again as we found in many of the examples from Newton and Priestley, the second part of the clause is also a metaphorical noun construction, and this too we saw was functional—in a complementary fashion, this second package told us what we **were** learning for the first time, what was the news that we had to attend to. Here however the second metaphorical package is a complex co-ordination of three pseudo-things:

cleaner factories
cleaner countryside

and an increase in the number of light-coloured pepper-moths.

Now of course we understand: the air is no longer polluted, so the factories, the countryside and the moths are all much cleaner, lighter in colour. But that is not at all the message the child is supposed to get. He is supposed to insert yet another logical relation in two places, with the second of them being in a very complex form—another logical relation **between** each pair of these co-ordinations.

happening 2 is:

2(a) the factories have become cleaner
so (& ∴)

2(b) the country side has become cleaner
so (& ∴)

2(c) there are getting to be more of the light-coloured pepper-moths (because they do not show up against clean trees and therefore do not get eaten by the birds as much as they did when the trees were dirty)

Now the writers would probably say that they wanted the children to work that part out for themselves, and that is reasonable; but it is not reasonable to expect them to struggle through such a linguistic swamp on the way, turning what could be a valuable intellectual exercise into a semantic obstacle course.

Now let me come back to the general principle. There are many types of grammatical metaphor in language, and like lexical metaphors, they constitute an

addition to the semantic resources of the language—to what I call its 'meaning potential'. In themselves, they are neither 'a good thing' nor 'a bad thing': like everything else in a language, they have to be understood in relation to their function. The particular kind of grammatical metaphor I have been referring to here, which is a metaphorical package in which happenings are treated as things, and the relations between happenings are presented as if they were themselves the happenings, is one that is typical of scientific writing, and in looking at the history of scientific writing in English, it is possible to show **how**, in what respects, it is functional. It provides a way of organizing (structuring) the information so that each step is clear in itself—the reader knows what he is to take for granted and what he is to attend to, and each step is clearly related to what comes before and after it. It is probably not too farfetched to say that this resource for metaphor in the grammar is one of the things that makes scientific discourse possible.

But it has to be learnt, and just as it seems to have evolved rather late in the history of **language** (this particular kind of ideational metaphor, that is), so it tends to be learnt rather late in the life history of the **individual**. In a sense, just as the move into **generalization** marks the transition to the mother tongue and the end of babyhood, and the move into **abstraction** marks the transition to writing and into school—from commonsense knowledge to educational knowledge—so the move into **metaphor** marks the transition from primary to secondary school: to learning that is based on the recognized school disciplines (science, maths, history, literature and so on) and on the different varieties of written English that go with them. So, children are likely to have problems if faced with and expected to learn from highly metaphorical texts at a stage where they are not yet really in control of this kind of language.

The task of the primary school is to ensure that the pupils' ability in written language has reached the level where they can use that language effectively as a means of learning. This is the minimum that the secondary school will demand. When the pupils make the transition into secondary education, it will be assumed that they can use the textbooks, and other written materials—their own notes, teachers' notes and handouts, the blackboard—as a source of information, and this means that **written** language must now be 'taken for granted' in the way that **spoken** language was taken for granted when they first came into primary school. They must now be ready to learn the languages of the disciplines, the functional varieties, or 'registers', that frame the discourse of history, of literature, of physics, biology and so on. Grammatical metaphor is the secret code that they have to break if they are to succeed in this next stage, since the technical languages of the secondary school **subjects**—and not just science: it is equally true of history and literature—all make extensive use of this metaphorical potential of the grammar. There are good reasons for suggesting, as Martin points out, that you cannot create technical discourse **without** grammatical metaphor (Martin 1993).

Lee Kok Cheong, in his valuable book *Language and Language Education*, puts some very pertinent questions regarding the teachers' use of language in the secondary school classroom (Lee 1983). He asks:

1. Is a linguistic register specific to a particular subject used in classroom? What vocabulary and structures characteristic of the register have been employed?
2. Is such a register specific to a subject expected of the student in the classroom? Do the students try to use such a register?
3. Does the teacher use language to mediate between the general experience of language (i.e. common everyday register) and the specific experience of language (i.e. subject-specific register and intellectual conceptualization) of his students?
4. Has the teacher used language for certain tasks which may be better explained by other verbal or non-verbal means (e.g. demonstrations, experiments, charts, symbols, etc.)?
5. Does the teacher use language whose level, register, and form may be outside the range of the students?
6. Are students expected to verbalize all non-verbal tasks?

These questions bring out very clearly the range of linguistic skills that are likely to be being demanded of secondary school pupils and also the level of **awareness** of language that is going to be needed by the teacher. This includes an awareness of register variation, and of the differences between technical and non-technical and between spoken and written, forms of English.

Now as Lee makes clear it is not the case that all the language activity in which the pupils participate in the course of learning science is going to be in the technical scientific registers. As a matter of fact, if we charted the course of their learning in detail, taking all the four skills into account, we should find that, clause for clause, there was as much non-technical discourse as technical, as much spoken as written. The importance of the written, technical material is that it serves certain very **specific** purposes—purposes that are vital to the development of the subject and are vital in the same ways to the development of the individual who is **learning** the subject. It is in the technical written discourse that the knowledge is codified, organized into a logical sequence, and—most important of all, perhaps—given a rhetorical, textual structure that enables each step to follow from one that has gone before and to lead on to further steps that are to come.

So, because it has these important and very visible functions, it is the technical writing that is most highly valued, in its status in education and in our culture as a whole. As a consequence, the other kinds of language used in learning tend to get forgotten. In monitoring their pupils' control of language, teachers naturally concentrate on this non-technical material, and they may forget that, even though the pupils are now literate and can learn from what they read, they are still learning a great deal through talking and listening. Written language never **replaces** spoken language as a medium of learning. What happens is that the two come to occupy complementary roles.

And this takes me to my final point in this lecture, which is to refer briefly to this complementarity between speech and writing as different kinds of language with which to learn. I have sometimes invited teachers to reflect on the following question: what aspects of your subject do you think are best presented to your pupils in writing, and what aspects do you think are best presented in speech? Usually they don't know, because they have not thought about it. But then I suggest that they might reflect on their own unconscious practice, as teachers, and ask themselves how they actually do distribute the learning tasks between these two

modes. I don't think the picture is simply random that any aspect of the subject goes over equally well in either mode. Rather, it seems that some things are easier to learn in the written language; other things are easier to learn through the spoken. If we are concerned with some phenomenon, some aspect of reality, from the point of view of its **structure**, we probably present the learner with a description in writing. This might be, for example, the structure of a machine: how it is constructed as an integrated whole, out of parts and parts of parts. But it might also be a more general structure: for example, the taxonomy of living things—plants and animals, invertebrates and vertebrates, fishes, amphibians, reptiles, birds and mammals, and so on. It might be an entirely abstract structure, like the definition of a term in mathematics, or a structure formed out of a whole set of interlocking definitions, e.g. the following from **Year 7 maths**:

Text 4.10

*A **circle** is a plane curve with the special property that every point on it is at the same distance from a particular point called the **centre.** The distance is called the **radius** of the circle. The **diameter** of a circle is twice the radius. The length of the circle is called its **circumference**.*

It is much harder to present, and to take in, this kind of information in speech. On the other hand, if we are concerned with some phenomenon from the point of view of what it does, its **operation**, we are likely to do better by **talking** about it and getting the learner to **listen**. With the machine, for example, we want to show what it performs and how it works and possibly also gives instructions for operating it; these things are more effectively achieved through speech. And again there are more general systems where we may be concerned with their operation: the rotation of crops in an agricultural economy, the water cycle, chemical and physical processes of all kinds. Here is a passage of spontaneous spoken language from a teacher talking about the process of water storage in reservoirs and the problem of seepage:

Text 4.11

We found that we could relate seepage to the surface area of the reservoir. It should really have been the wetted area of the bed of the reservoir; we didn't know that, we couldn't calculate that easily. We could calculate the surface area of the reservoir; and we related the surface area to the seepage by a very simple equation, where seepage was naught point naught naught four five times surface area. In other words it was the surface—this is all in metres again, cubic metres I should say—the surface area in square metres multiplied by, in effect, four and a half millimetres per day. So seepage was equivalent—if there were no inflows, if there were no outflows, if there was no evaporation off the reservoir, the reservoir level would go down by four and a half millimetres every day: so empty, very quickly.

<recorded by Tim Johns, University of Birmingham>

Even the equation figures naturally in the spoken discourse, as it fits into the discussion of the whole related sequence of events.

It is not perhaps too difficult to understand why there can be this functional complementarity of speech and writing in the teaching process: it derives from the differences we have already begun to notice, between spoken and written language. Written language, as we have seen—at least the written language in which educational knowledge is represented—presents us with a world of **things**. By means of grammatical metaphor, it expresses phenomena of all kinds in a nominal form: as nouns, nominal groups and nominalizations, leaving the verbs to express the logical relations **between** them. In this way, it gives us a **synoptic** view of the world. Whether it is describing a circle, the structure of a machine or a chemical compound, or the organization of society, the written language presents it as an object, as something that exists. In other words, writing makes the world look like itself: after all, that is what written language is—it is language in the form of an object, a text that exists.

How can we contrast this with speech? We still have not looked very closely into the nature of spoken language; but we have had a number of examples of natural, spontaneous speech and can perhaps derive from these some insight into its essential characteristics. Where writing favours nominal constructions, speaking favours clauses, and a clause is a way of representing phenomena not as things but as processes—actions, events, behaviours, and the processes of human consciousness. So, spoken language tends to give us a **dynamic** view of the world. It talks about coming into being, changing, interacting and moving in a continuous onward flow. In spoken language, phenomena do not exist; they happen. Again, speech makes the world look like itself: this is what spoken language is—it is language in the form of process. It never exists; it simply happens.

Speech is no less highly organized than writing and no less complex, but its organization and its complexity are of a different kind. One of the most harmful of the prevailing myths about language—harmful in relation to language education, in particular—is that spoken language is disorganized, unstructured, formless and disconnected. It is not. But it is organized in its own way. This gives it a particular kind of complexity, which we can see in its grammar when we contrast the grammar of speech and writing. Our written examples have had very complex, densely packed nominals, but very simple clauses, often of the form of '*a* is *x*', or '*a* causes *x*' or '*a* arises from *x*', and further, because all the semantic relations are packaged into these nominal constructions, most of the sentences consist of just one clause. In the spoken language, on the other hand, the semantic relations are strung out into long sequences of clauses; so while the **nominal** constructions of speech are simple—often just a noun, with an article of some kind—the **sentence** constructions are often extremely intricate.

So, the grammatical intricacy of the spoken language contrasts with the lexical density of the written; each has its characteristic grammar, from which it derives its special power. And the point I have wanted to bring out, as my final comment for today's talk, is this: each of these two has its place in education, as a form of language for learning with. But the two are complementary. Some things we learn more readily by reading and writing about them; other things we learn more readily by talking and listening about them. Or rather—since that pushes

them too far apart—let me put it this way: for any phenomenon, anything that we want to learn about, there are likely to be some **aspects** of it that are more accessible in writing and other aspects of it that are more accessible in speech. It is that kind of complementarity we need to recognize. Teachers often do recognize it, unconsciously, since it is reflected in their actual practice, the way they teach. But I think we need to recognize it explicitly, in our discussions on the subject of language education, and in the various in-service and other activities that are part of a teacher's professional formation.

In my next talk, I should like to pursue today's investigations one stage further, to consider in more detail the language of the disciplines and language activities of the classroom. There the emphasis will be more on the secondary level, and on the notion of register—the different functional varieties of a language that contribute to the more subject-oriented learning that we expect of our adolescents. Thank you for your continued patient attention.

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Chapter 5
The Language of School 'Subjects'

In previous lectures, I invited you to consider how children develop, from birth, in home and family, through the neighbourhood and perhaps preschool and kindergarten, into the status of 'being educated'; and to look at this development from the point of view of language. I suggested that, if we take a linguistic perspective on learning, we will be able to understand better the true nature of what it is that a child is accomplishing, and of the learning tasks, and the learning difficulties, that may arise on the way. The better we understand these processes, the more likely we are to be able to act effectively, and to know how to intervene when things go wrong.

Here, I shall attempt to pursue this theme one step further, into the next stage of schooling.

In today's talk, I should like to consider that stage of educational learning that we call 'secondary' education: when the learners have made the transition into a form of learning that is based on the accepted divisions of knowledge into different disciplines, or different 'subjects' as they are normally called in school. The pupil now has a timetable, with every period labelled: English, Maths, Geography, etc.; he will be taught by different teachers; he may move from one **place** to another, and may even work in his different subjects with different groups of his peers. He probably carries round with him a large number of books, frequently dropping them on the way, and he is beginning to show a distinct set of preferences for things he likes learning and things he does not. (There are some of course who like everything, and there are some who like nothing at all, but most seem to be somewhere in the middle.)

When you learn a subject, you have to learn its language. You have to learn some technical terms, and in my experience, children are not the slightest bit worried by this—teachers complain much more about technical terms than their pupils do. But more than that, you have learned the forms of discourse that are acceptable in the discipline—the semantic styles, the ways of joining things together, what goes with what; and the registers—notes, essays, reports, tables etc.—in which this discourse is organized. I should like today to try to identify some of the salient features of this subject-based learning, those that determine most crucially the kinds and levels of demand that are going to be made on the linguistic resources of the learner.

M.A.K. Halliday, *Aspects of Language and Learning*,
The M.A.K. Halliday Library Functional Linguistics Series,
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Let me start by looking at some brief examples of the language of Year 7 textbooks—the first year of secondary school in Australia:

Text 5.1

(a) The square of a number is the product obtained by using the number as a factor twice. The square root of a number is the number which has to be used as a factor twice to give this number as a product.

(b) Convective uplift
Air in contact with a warm surface will become heated and expand, causing it to rise. Dew point will be reached, condensation will take place, and convectional clouds will form.

(c) Organs are the next level of body organization above cells and tissues. When several tissues work together to do a necessary job, the structure they make is called an *organ*.

Faced with examples like these, you are in no doubt where they come from. They are from science textbooks: textbooks of mathematics, geography and biology. If you are asked **how** you know and how you were able to decide, you would probably refer to the vocabulary: to lexical items such as square root, product and factor; dew point, condensation and convectional; and organs, cells and tissues. These are technical words, functioning as technical terms in the disciplines in question.

If I then pressed you for more evidence in the language, you might refer to certain features of the grammar. For example, the use of an identifying clause structure is characteristic of definitions, as in example (a): the square of a number **is** the product obtained by using the number as a factor twice. These three examples do in fact illustrate clause types that are especially frequent in scientific textbooks: (i) identifying clauses in simple present tense, with *be* or one of its synonyms, functioning as definitions; (ii) again identifying clauses: the first with the verb *be* giving a generalized description, second a 'reverse definition' with verbs such as *is called*, and the two together functioning effectively as a definition; and (iii) a generalized description of a related set of processes, this time represented in the grammar as material processes (*become heated*, *expand*, etc.), embodying a general principle as a prediction of what will happen if certain conditions are met—if air comes in contact with a warm surface. These are three slightly different but related ways of stating general principles that the learner must understand **and remember** in order to progress further.

Now, let me present two slightly different types of example:

Text 5.2

(a) Michael has 8 coins which are worth 39c. If he has only 10c, 5c and 2c coins and the number of 2c coins is one-third the number of 10c coins and 5c coins combined, how many coins of each kind has he?

(b) Cut an onion in half, and then in half again, as shown. Separate some of the layers (fleshy scale leaves) from one of the quarters. Then using tweezers, peel off a small piece of the thin, transparent material from one of these scale leaves.

Here, there are no technical terms, and if we just looked at the lexical items, the vocabulary, the second might seem to belong in a cookery book. The first might be Michael being required to give an account of his pocket money. Yet we still recognize them as what they are: textbook language. So we must be using some other information. What we recognize here is a more complex clustering of grammatical features from the systems of transitivity, mood and logical–semantic relations. In **mood**, the first ends with an interrogative, the second is a string of imperatives; in other words, each makes a specific demand on the reader, to answer a question or to carry out certain instructions—putting the ball in the learner's court. In **transitivity,** the clauses in (a) are all possessive except for one identifying; but the clue lies in the logical–semantic relation that is set up among them: two of them, by means of the *if*, are presented as a hypothetical condition that is to be assumed, and the question is to be answered on the basis of that assumption—a typical teaching strategy. The second, a set of material processes ordered in a temporal sequence, is typical of any set of instructions; observation or experiment in the science lesson is only one of the possible interpretations, and we might not be sure until we had got to the next clause which is:

Place the onion sample in a drop of water in the centre of the microscope slide.

The point I want to bring out here is this: when we recognize that a text belongs to the language of school science, we are not simply reacting to a set of technical terms. These are certainly important—in fact, they are essential; but they are not the whole story. Nor are we simply recognizing the technical vocabulary in its appropriate grammatical environment: the transitivity—that is, material processes for experiments and observations, relational (identifying and attributive) processes for descriptions and definitions; and the logical–semantic relations for conditions, temporal sequences, causal claims and the like. We have seen these emerge in the history of scientific English, along with the patterns of grammatical metaphor that evolved to facilitate their organization into discourse, and again, they are a necessary and central component, but still not quite all. These are all various aspects of language to think with. But there are also the 'doing' parts of the grammar: the moods, expressing different speech functions—imperatives for instructions, interrogatives for questions and so on; the modalities, for expressing the degrees of probability and usuality; and—once we get away from the impersonality of the textbook—a whole range of grammatical devices that we use for expressing our feelings about things, as Kristy was doing when she felt sorry for the moth that had fallen into the water. Once we take account of all the other components of the language of educational learning—the teacher's talk, the pupils' notes, their working out of problems in class or as homework, their discussions with each other and so on—it becomes clear that language for education is not something that can be defined merely in terms of its **content,** as 'language that is about' some particular areas of knowledge. It is also language **for learning with**, and learning is a complex of very many different activities.

How can we approach the problem of describing the language of subject learning in a way that will not just describe it but at the same time explain it, saying why it is

that it takes the forms it does? I have tried to suggest in these lectures that to think linguistically, and in particular to think **grammatically**, about something is usually a good way to explain it, and I have given a number of examples, ranging from the clause as a theory of experience to grammatical metaphor as the foundation of the language of scholarship. I hope to have convinced you that grammar is not an arbitrary set of rules; in fact, it is not a set of rules at all—it is a resource, an openended network of choices which enable you to mean—that is, to interpret, to participate in and ultimately to **change** the world. But we need to explain how it comes about that grammar has this power of creating reality, such that if you know a language, then you can not only write and speak in that language in ways that are appropriate, that contribute effectively to whatever it is you are doing, but you can also, just by listening or reading, reconstruct the context in which any piece of discourse makes sense. (If you could not do this, there would be no imaginative language—no fiction in literature, and not many kinds of poetry either.)

So if you recognized, from the grammar (and I remind you that, as always, grammar includes vocabulary; it is short for 'lexicogrammar'), that a passage of text was taken from the context of learning mathematics; and if you could in fact tell a great deal more about it—*was it spoken or written? who said or wrote it—was it teacher or pupil, or textbook writer? what kind of activity did it form part of,* and so on—this is because the grammar of a text in some way matches up with its environment: with what is going on, who is taking part and what they are doing with their language. In other words, to put this in more technical terms, the **register**—the particular functional variety of English, or whatever language it is—reacts with the **context of situation**. There are regular general principles governing the relationship between the meanings that are expressed and the environment in which they are expressed, principles which enable us to understand something of **why** people say and write what they do.

We can summarize these under three headings, which in fact I have already referred to, informally, as the salient features of the environment. Whenever language is used—and that means whenever human beings are engaged in any kind of shared activity—we can pose the following three questions:

(i)	What is the nature of the activity taking place?	–	we call that the 'field'
(ii)	Who are those taking part?	–	we call that the 'tenor'
(iii)	What part is the language playing in this activity?	–	we call that the 'mode'

These three headings, the field, the tenor and the mode, are the three aspects of the situation (of the 'context of situation', as it is called) that have an effect on the language. To put that another way round: if I want to predict what is being said or written on any occasion, those are the three things I need to know. Of course, I can never predict with certainty—people can always choose to be irrelevant; but my predictions will have a strong likelihood of being right. There is no magic in this; we live by making such predictions all the time. So if a person tells you that she went to a new tailor to choose material and be measured for a skirt and blouse, that is to say:

field: service encounter, custom tailoring: women's clothing
tenor: tailor and customer, previously unacquainted
mode: spoken language, for negotiating, and for carrying out measurements

you could make a good attempt at construing the dialogue **without** actually having been present on the occasion. In very general terms, it is the field that enables you to predict the ideational or content meanings—the lexical items, transitivity patterns, logical–semantic relations and so on; it is the tenor that allows you to predict the interpersonal meanings—the mood and modality, the tone and key, the connotations of attitude and evaluation, and it is the mode that enables you to predict the textual meanings—how the messages are organized, the rhetorical development of the discourse around certain themes, and the strategies used to hold it all together.

Of course, the more detail of the situation we give, the more accurate our guesses about the language used will be; but even a few very broad, general characterizations like the tailoring example can provide a significant account of information. So let us return to the language of the secondary school. If I describe the context of situation of a particular event as:

field: secondary education; history class
tenor: teacher and pupils, Year 9
mode: spoken, teacher eliciting and checking

(that is, finding out whether the pupils know what he expects of them)—again you can predict a great deal about the likely discourse. If I then add that the occasion is a formal test, the teacher is above middle age, and the topic is the Mongol empire of Genghis Khan, then, of course you can come a lot closer with your predictions; but even without that, merely by knowing it is a question–answer session in a Year 9 history class, you can imagine many of the kinds of things that would be said—the meanings, and also the grammar (the words and the structures), that would be being used to encode them. What we try to do in educational linguistics is to make explicit the way in which the discourse matches up to the context, stating this in the form of general principles with explanations. Sometimes, the explanations will be obvious enough: if the teacher is trying to find out how much the pupils know, he will presumably ask them questions and therefore will use clauses in the interrogative mood. But other features are very much less obvious: for example, the semantic strategies that textbooks use to introduce different kinds of technical terms, or those that teachers use to reconcile the two aspects of their roles as teachers—imparting wisdom while also maintaining authority and keeping order in the classroom.

Now you may ask why do **we** need to think about all these things? They may be of interest to a linguist; but as educators can we not just take them for granted? As long as there are no problems, then no matter what kind of phenomenon we are dealing with we can always take it for granted; there is no need, other than pure curiosity, to understand how it works. But education is not an area in which there are no problems. We are not satisfied with the results achieved, and so we do need to understand in order to intervene, to make the processes work more effectively. The core of all subject learning in school is the language that is used to learn with

and to teach with; yet this has been the most neglected aspect of educational research and of teacher training. We need to have a clear idea of the demands that are being made on the language capabilities of the learner. The pupils, after all, are having to build up for themselves all these kinds of expectations about the language, so that they know where they are and do not get lost along the way.

The main error that we usually make in thinking about the language of school subjects is to assume that it is entirely determined by the 'field': that is, that if you are studying chemistry, then all you need to know is the language of the subject matter of chemistry, the technical terminology of the discipline. I have already pointed out one of the shortcomings of this view, in earlier lectures: that it focusses too much on words, on vocabulary instead of on the grammar as a whole. But even if we include the grammar, to focus exclusively on the subject matter is still to ignore the realities of the learning process. In the first place, the **field**—the activity that is taking place—is not chemistry; it is 'learning chemistry', with 'learning' here meaning specifically 'learning in school', or rather 'learning as an educational process'; and we have already stressed the importance of defining the field of activity in this broader sense. In the second place, as well as the field, we have to take account of the tenor and the mode. As regards the **tenor**, there are a number of different role relationships involved which we should perhaps enumerate: not only teacher and pupil, but also textbook writer and reader, parent and child, pupil with classmates and so on—all these interpersonal dimensions may enter into the learning process. In other words, the learner is involved in a particular set of social relationships; that of pupil to teacher is one—perhaps the most important one—but there are all those other relevant ones besides. Then, there are the variations in **mode**: we learn through the spoken as well as through the written language, with a variety of modes in each—let us list these also:

1. classroom modes: the teacher may be using spoken language in (a) giving out information to the pupils, (b) giving them instructions, (c) inviting them to work things out, and (d) finding out what they have learnt; he may be using written language for illustrating, setting homework;
2. textbook modes: the textbook writer is using written language (a) presenting information, including descriptions, explanations, definitions and general principles; (b) illustrating that information by means of examples; and (c) setting exercises and tests.

But as well as teacher–pupil and textbook writer–reader, there are other kinds of tenor besides: that is, other interpersonal relationships into which the learner enters in the course of learning the school subjects. Let me illustrate with one that you might not think of so readily in this connection: this is another kind of language that contributes to the learning of science.

In Text 5.3, an Australian mother is helping her daughter with her chemistry homework (Year 7). So here the tenor is that of child and parent, though still clearly

within the educational field; the mode is spoken, with a combination of instruction, general explanation—a kind of consciousness-raising, and encouragement and reassurance.

Text 5.3

Cherry:	Oh no, these are dreadful! I've never done Science tests before.
Mother:	Of course not, and that's why you must do it. Practise and practise and practise! It's because what you're doing is learning all the techniques and the jargon and all that sort of stuff. The more tests you do, and the more different ways that questions are put to you, the more you're going to understand what the questions are about. [family noises] So what you're doing is sort of having a big bath of scientific language, and the more times you get into the bath, the better you swim. And these kinds of tests, these kinds of tests are really good, because at school the teacher knows what she's taught you, and she knows the words she's used and everything else. These tests are sort of generalised so there's no way that they can know exactly what you've learnt; but they know approximately what you should be learning about, so they ask you questions to test how much of the information has gone into your brain and been assimilated, so that you can reproduce it even if the question is slightly different.
Cherry:	I don't care if you give me hints, but I want to do it myself.
Mother:	No I'm not going to give you any hints at all, we're going to discuss strategy. So number one is to know that it's not going to be anything specific about what you've learnt. When you open the page and read the questions, you have to know that it's not going to be a specific question that you've been taught by Mrs Hingston; it's going to be a general question relating to a lot of the things you've learnt, and you've got to pull all that information together to answer it, o.k.? - and also common sense plays a big part in these things, right?
Cherry:	Oh yes.
Mother:	Now the first thing you do when you go to one of these things is that you read all the rules.
Cherry:	[reading] 'Do not open the book until told to do – to do so by your teacher. The quiz consists of 30 multiple choice questions to be answered in one hour.'
Mother:	O.k., so what's important about the comment there? I mean 'do not open the book': that's just … – what's important about that?
Cherry:	Timing.
Mother:	Right; exactly. So you sort of quickly say to yourself: '30 multiple choice question in one hour' – so what do you say?
Cherry:	Oh, well, you'll be able to do those in … – take two minutes to do each question

<text by courtesy of Robert Borel>

Notice three things about this text. First, Cherry's mother is talking to Cherry about the nature of the learning process; she is not teaching her chemistry, but rather teaching her **how to learn** chemistry; in this case, specifically how to approach a test she is going to do, and what the **purpose** of the test is. Later in the text, we find them discussing how to do multiple choice questions, how to plan out the time of the test and so on.

Secondly, the text is **conversation**. There is interaction all the time between Cherry and her mother (as there was with Kristy at 3½; Cherry is just 12), and it is informal conversation of a family kind, with the usual interruptions and asides.

Thirdly, the **grammar** is that of informal conversation: alternating between short simple exchanges and longer passages in which the sentence structure is highly intricate. This kind of grammatical intricacy is a typical feature of fluent casual speech, and it is particularly suited to certain kinds of learning, such as how to perform complex operations—like doing a science test. Cherry's mother is in fact putting over a very important point—the fact that you can reasonably be expected to know more than just what the teacher has taught you. In other words, it is not just the sympathy and interest shown by Cherry's mother in her daughter's learning that is important, but the fact that this kind of informal interaction in the home is actually a very appropriate context for certain aspects of the learning task, because it engenders the kind of language, the kind of grammar, that is particularly well suited to this sort of task.

So the language of school subjects does not simply mean the technical written language of the subject textbooks, important though that is. It includes a range of different registers which, though they may share the same field of discourse, vary considerably in tenor and mode. We have seen the kind of language a parent may use in discussing the learning of the subject with a child in the home. What then can we say about the language of the classroom? How is the teacher's talk typically organized, during the fixed periods of time that are allocated to learning a subject in school?

Unlike homework, which has hardly been observed at all, there have been numerous studies of classroom interaction; though until fairly recently, these were not based on an accurate linguistic analysis. The breakthrough came with Sinclair and Coulthard's work discussed in their book *Towards an Analysis of Discourse* (Sinclair and Coulthard 1975). Sinclair and Coulthard of the University of Birmingham analysed a corpus of data from schools in central England and proposed a general model of how teachers organized the lessons. Their initial sample was from pupils aged 10–11; but subsequently, this was extended to cover 'children in different age groups, in different schools, being taught different subjects by teachers with differing degrees of formality. The system … is now able to cope with most teacher/pupil interaction inside the classroom'.

A lesson, Sinclair and Coulthard say, consists of a series of transactions, which can occur in any order. These transactions are of three major kinds: the teacher is (1) informing, (2) directing or (3) eliciting—giving information, giving instructions, or getting responses from the pupils. Each of these transactions tends to have a clear boundary, with an initial exchange setting it off, e.g. *Now let me test your brains: let me see if you can think of some materials I'm going to ask you about* and a final exchange showing when it is terminated; in between are the various exchanges through which the transaction (informing, directing or eliciting) is carried out. The exchanges in turn consist of moves, little sequences such as:

V Classes of act (realized as clause or clause complex)

1	marker		
2	starter		
3	elicitation/check/directive/informative		in "opening" move
4	prompt/clue		
5	cue / bid / nomination		
6	acknowledge		
7	reply / react		in "answering" move
8	comment		
9	accept		in "follow-up" move
10	evaluate		
11	silent stress		in "framing" move
12	metastatement / conclusion	1	
13	loop	2	
14	aside	8	in "focusing" move
		12	

IV Classes of move:

framing	focusing	realize	boundary exchanges
opening	answering	follow-up	teaching exchanges

III Classes of exchange:

boundary
teaching: free exchanges: teacher (inform, direct, elicit); pupil (elicit, inform);
check bound exchanges: (reinitiate/list/reinforce/repeat)

II Classes of transaction:

Teacher ⟋ informing
— directing
⟍ eliciting
} all Prelim + Medial + Final

I Lesson
[consists of an unordered series of **transactions**]

T: What did the Egyptians call their rulers?
P: Emperors
T: No, not emperors
P: Pharaohs
T: Pharaohs, yes

And each move, in turn, consists of a sequence of what Sinclair and Coulthard call acts. They recognize fourteen major classes of act, such as 'starter', 'acknowledgement', 'check', 'comment' and 'evaluation'; and for each act, which corresponds to

one clause or clause complex in the grammar, they can specify the grammatical features that are present. For example, for the kind of act, they call a 'check' they say:

> *realized by a closed class of polar questions concerned with being "finished" or "ready", having "problems" or "difficulties", being able to "see" or "hear" ... The function of checks is to enable the teacher to ascertain whether there are any problems preventing the successful progress of the lesson.*

An instance of a 'check' is 'Do you remember our earlier example?' or 'Can you see where it's cut through the rough edge of the metal?'

So what Sinclair and Coulthard were able to do was to show by linguistic analysis the way the classroom functions as a context for learning in English schools. They were not saying it was ideal, nor were they trying to criticize; they were trying to understand how it works. A lesson is a language activity of a very complex kind; we can see from their studies how teacher and pupils use the resources of the grammar to produce the basic acts and to organize these through a hierarchy of different units—acts, moves, exchanges and transactions—into a reasonably coherent activity covering the regulation 45 min, or whatever the prescribed length of lesson happens to be.

Their study reveals that there are patterns of teaching that are common to all subjects. If we are looking at the way discourse is structured in the classroom, what determines this is the fact that it is a classroom, in a school, in an educational system, with a teacher interacting with a class of pupils. In other words, it is the tenor and the mode that sets the pattern of classroom discourse, rather than the field —whether it is science, or social science, or humanities. Of course, there is also much that is determined by the field. But since teachers tend to be aware of the linguistic differences resulting from different subjects, and rather less aware of the linguistic similarities that go across the learning of all subjects, I think it is worthwhile dwelling on this point.

There is in fact an interesting illustration of the tendency to assume that subject differences are more important than the common features shared across all learning contexts, in the recent history of the teaching of English as a second or foreign language around the world. In general, teachers of English as a second or foreign language have been leaders in language education in trying to apply the findings and the principles of linguistics to educational tasks; and if they have made mistakes in the process, we have all learnt from these mistakes and can be grateful to them for having ventured into the area first.

There are always problems, and pitfalls, in applying general principles drawn from theory to particular practical tasks; and language education is no exception to this. In fact, the teaching of foreign languages, the world over, provides what is perhaps the paradigm example of this phenomenon. People have always, in all human communities, learnt each others' languages; they have had to, for trade and intermarriage, as well as for various more repressive forms of contact. But then, at certain times in history, **education** takes over and languages come to be taught. The target language—the one that is being learnt—is then analysed, with the quite

correct assumption that this analysis can be a valuable aid to teaching. But what happens next is that instead of teaching the **language**, the teachers start to teach the analysis. Grammar, instead of being a **tool** for language learning, becomes an alternative to it, and the student, the learner, no longer learns the language—he learns about the language instead. It is rather as if someone wanting to play the violin is taught musical theory without ever actually learning to perform on the instrument.

Enough has been written over the past 100 years about the pitfalls of the 'grammar translation method' in language teaching; there is no need for me to belabour the point here—I am using it merely as an illustration of how good intentions in the use of theory can so easily be sidetracked. I do want however to give two more specific illustrations from the recent history of English language teaching, because these bear directly on the question in hand. During the 1960s, two important notions deriving from European, and particularly British, work in theoretical linguistics were introduced into English language teaching: the notion of '(context of) situation', and the notion of 'register'. Both of these notions had been developed by J.R. Firth, Professor of Linguistics at the University of London (Firth did not use the term 'register', but he had the concept under another name), and Firth, in turn, was building on earlier work, particularly that of the great anthropologist, Malinowski, and of the linguists of the Prague School. The notion of context of situation was applied to English language teaching in the form of the 'situational' method, and the notion of register was taken over as LSP 'Language for Specific Purposes'—or in the case of English, ESP 'English for Specific Purposes'.

These were both praiseworthy attempts to apply important theoretical insights to practical purposes. But both led to disappointment—there was a failure to live up to expectations—because they were applied too hurriedly and with insufficient understanding. The 'context of situation' was misunderstood to mean the immediate setting of the discourse (what Hasan calls the 'material situational setting'): so we had English lessons called 'at the post office', 'at the railway station', 'in the hospital' and so on. But this is not what context of situation means. The 'context of situation' for language is the sociocultural environment in its broadest sense; much of the time, this has very little to do with the actual physical setting in which people are speaking or reading and writing, and much more to do with the activity patterns, the social values and the rhetorical styles that are characteristic of the culture as a whole. Secondly, the 'register' was misunderstood to mean the subject matter, the particular content area of the discourse; so we had textbooks of chemical English, medical English, banking English and so on, in which the entire discourse was built around the topic of chemistry, of medicine or of banking. But, as we have seen, this is not what register means. The register includes not only the field of discourse, but also the tenor and the mode, and even the field is not restricted to the subject matter.

It took about fifteen years for these notions to be recycled into language teaching practice in a way that reflected what they really meant; it was necessary first to back off and rethink, and then after an interval, it became possible to apply these ideas with considerably greater understanding. This then leads to so-called communicative language teaching, which does correspond much more closely to the idea of 'context of situation' and to a new round of LSP represented, for example, by the teaching of English for tertiary students ('English for academic purposes'), in which the student learns not so much 'the language of biology', defined by subject matter, but rather the register range that is called into service by the task of studying biology at a tertiary level, including listening to lectures, taking notes, working in the laboratory, using the library, interacting with a tutor, writing assignments and so on. It is in this kind of teaching that the linguistic theory of register comes to be applied, exploiting not only the broader notion of 'field' but also the notions of 'tenor' and 'mode' as well.

So when we are exploring how the theoretical interpretations drawn from linguistics, (1) in relation to the general principles of language education (from the 'language in the classroom' strand), and (2) in relation to the language of particular school subject areas (from the 'language of the disciplines' strand), can be put to practical use by those who are teaching at this level, it is good to be aware of previous experiences where ideas have been too superficially translated into educational practice. It is always tempting to get to work immediately, **applying** the latest ideas, without asking whether the ideas themselves, and the relevance they have to the task in hand, have been fully understood and explored.

Let me now turn to what I consider to be a very penetrating analysis in which these two strands are combined. Jay Lemke, Professor of Science Education at the City University of New York, has proposed a model for exploring the fundamental tasks of subject-based learning from a point of view that takes account of all the relevant principles. Lemke, in his book *Using Language in the Classroom*, written for teachers, analyses the task of learning a subject discipline into two main components, which he calls 'thematic systems' and 'activity structures' (Lemke 1985). The thematic systems constitute the way the content of the subject is organized and developed in the educational process, and we can get at this by studying the language that is used and looking at 'the meaning relations among the terms and expressions'. The activity structures are the patterns of interaction in the classroom (or the laboratory, etc.), and again, we can get at these by studying the language, but this time looking at patterns of 'getting started, introducing topics, asking and answering questions, interrupting, keeping control, confirming answers, summarizing and so on'. Thus in relation to register theory, the thematic systems relate more to the field, the activity structures to the intersection of the tenor and the mode.

Text 5.4

1	T:	Before we get started … before I erase the board –
2	Students:	Sh!
3	T:	Uh – Look how fancy I got – [points to the board]
4	Student:	[Makes a funny noise]
5	Students:	Sh!
6	T:	This is a representation of the 1S orbital.
7		S'posed to be of course – three dimensional.
8		What two elements could be represented by such a diagram?
9		Jennifer?
10	Jennifer:	Hydrogen and helium?
11	T:	Hydrogen and helium. Hydrogen would have <u>one</u> electron –
12		somewhere in there – and helium would have?
13	S:	<u>Two</u> electrons
14	T:	Two. [pause] This is 1S, and the white would be?
15		Mark?
16	Mark:	2S
17	T:	<u>Two</u> S. and the green would be?
		[Uh … Janice
18	Janice:	[2P 2P
19	Janice	2 [P
20	T:	[Two P. Yeah the green one would be 2P*x* and 2P*y*. If
		I have
21		one electron in the 2Px, one electron in the 2Py, two
22		electrons in the 2S, two electrons in the 1S; what element
23		is being represented by this configuration?
24		[screeching noise] Oo! That sound annoys, doesn't it?
25		Ron?
26	Ron:	Boron?
27	T:	That would be – that'd have uh – <u>seven</u> electrons, so you'd
28		have to have one here, one here, one here, one here, one
		here
29		[one here. Who said it – you?
30	Student:	[Carbon
31	Students:	[Carbon Carbon
32	T	Carbon. Carbon. Here. Six electrons
33		And they can be anywhere within those – confining orbitals
34		This is also from the notes from before. The
35		term orbital refers to the average <u>region</u> transversed by
36		an electron. Electrons occupy orbitals that may differ
37		in size, shape, or space orientation. That's – that's from
38		the other class, we might as well use it for review

Note: underlined words signify stress or emphasis in the voice recording of the lesson episode.

[indicates the point at which two or more passages of discourse overlap.

Text 5.4 is a passage of transcription from a science lesson that Lemke observed in an American high school. His discussion of it is too long to quote in full—it takes up many pages of his book. But let me pick out two of the steps in Lemke's analysis to give an idea of how he interprets the thematic systems and the activity structures.

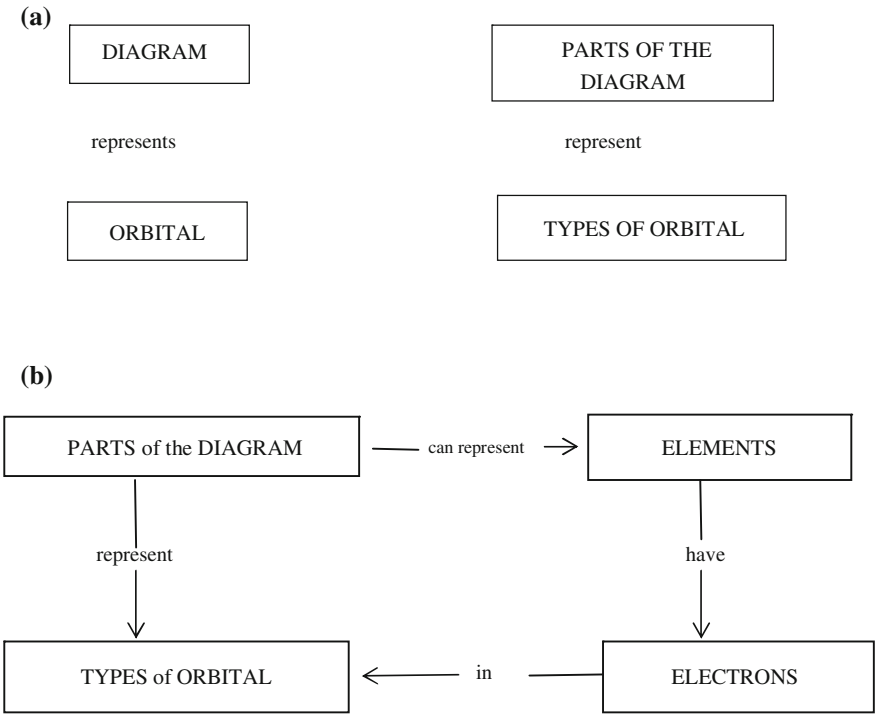


Fig. 5.1 **a**, **b** Representation of the thematic system

First the thematic system. In this text, we find the technical terms *electron*, *orbital* and *element*. We find **kinds** of element (*hydrogen, helium, boron* and *carbon*), and also **kinds** of orbital (*1S, 2S, 2P, 2Px* and *2Py*). Looking at the first part, up to around line 20, we could construct a representation of the thematic system as in Fig. 5.1a.

This part of the text consists in interpreting the diagram that the teacher has drawn on the blackboard, both the diagram as a whole and also the various parts of the diagram. If we continue with the second half of the passage, lines 21–37, we can fill this out so that instead of being just an interpretation of the diagram, the discourse constructs a more complex thematic system in which (1) elements 'have' electrons, (2) the electrons 'are in' different types of orbital; thus (3) parts of the diagram can represent different elements. Lemke represents this as in Fig. 5.1b.

This thematic system is mapped into a certain pattern of activity structures, largely (apart from the drawing of the diagram itself) in the form of interaction strategies in which the teacher is using the question–answer mode. Lemke summaries the basic pattern of question–answer as a teaching strategy as shown in Text 5.6; each line represents one move:

Text 5.5

(Teacher prepares context for question)
Teacher asks question
(Students raise hands or otherwise bid for right to answer)
Teacher nominates one student to answer
(Student answers question)
Teacher evaluates student's answer
(Teacher elaborates on a student's answer)

Moves in parentheses (…) are optional.

He has included here, in parenthesis, moves which are optional; they may not occur in every instance, but they are typical of this kind of interaction and do in fact occur in the lesson in question.

Three of the points that Lemke makes in his discussion of this kind of discourse are particularly important for us here. One is that while the activity structures are linear—that is, they have to follow one another in some kind of linear sequence: you can nest them, one inside another, interrupting one and coming back to it, but since they are activities, they are obviously taking place in time—the thematic systems are **not** linear; what is being built up through the classroom activity is often a complex system of relations along many different vectors, different kinds of relationship, and inevitably, this imposes very great demands on the teacher's use of language and the pupils' understanding. We need to consider it in relation to what I was saying in my fourth lecture about the complementary roles of spoken and written language in the contexts of learning.

Lemke's second point is that there is always a great deal of intertextual reference in the language of the classroom. Much more than is often realized, teachers rely on the continuity of the discourse over months or even years of schooling. I have noticed this in studying the language of materials in textbooks over the first few years of secondary school, Years 7–10; it is extremely difficult ever to retrieve a piece of knowledge from further back if the student has forgotten it, or missed some lessons through illness, because each new step (and here comes grammatical metaphor again) may depend on a summary, a putting together, of a large cluster of previous learning points, and if this is true of the textbooks, which are presented in a reasonably systematic and ordered fashion, it is a great deal more true of what the teacher has presented in his talk. To take a small example from this text, in line 23 the student must know that 'configuration' is short for the technical term 'electron configuration' which the teacher has used in a previous lesson.

And Lemke's third point is one that derives from the first two: namely, that much of what the pupils have to learn is in fact implicit, not explicit, in the discourse through which the subject is presented. I quote Lemke here:

> To a greater degree than we may realize, thematic systems are learnt in much the same way that we learn the semantic system of our own native language: **implicitly**, by hearing, speaking, being corrected, but mostly by shaping our speech to conform to what we hear around us, inferring patterns of meaning relations between terms and longer expressions from their use in context …

> The discourse of the science classroom constantly and pervasively shows this kind of subtle **implicit** structure of building thematic relations that is probably outside the conscious recognition of teachers and students as it happens. By contrast, **explicit** formulation of definitions and relationships is brief and occasional.

As an example of what is implicit in the lesson in question, Lemke points to the fact that here there is 'an entirely **implicit** development of a contrast, important to the whole lesson, between **orbital diagrams** that can represent **several** elements, and **electron configurations** which represent a **particular** element'. This can be seen by comparing the wording of the teacher's question in line 8:

> *What two elements could be represented by such a diagram?*

with the questions in lines 20–23

> *I have one electron in the 2Px, one electron in the 2Py, two electrons in the 2S, two electrons in the 1S; what element is being represented by this configuration?*

As Lemke notes,

> As is typical in all these science lessons, the system of thematic relations that is needed to make sense of what is said must be gleaned from the 'context', that is, from specific ways in which expressions are used in relation to one another, differently at different points in the text.

Lemke, then, has taken an important step here in showing how the field is organized into thematic systems, which are then mapped by the teacher into activity structures deriving from the tenor and the mode—the interpersonal relationships of teacher and pupils, and the forms of discourse, spoken and written, that the teacher can draw on.

Let us look at an example of how one of Lemke's thematic systems is being developed in a Year 7 geography textbook. The analysis is by Peter Wignell, of the University of Sydney (Wignell 1989). We go back briefly to Text 5.1. Wignell is interested in how the thematic systems are built up through the use of technical terms. The most fundamental relationships are the taxonomic ones of superordination and composition, '*a* is a kind of *x*' and '*a* is a part of *x*', both involving simple generalization; so, for example, *climate* is **divided into parts** (solar radiation, temperature, pressure systems, atmospheric moisture and air masses—that gives its composition) and **distinguished into types** (tropical/subtropical/temperate/cold, with three subtypes of cold: boreal/polar/highland—that gives its superordination). This gives us an interrelated set of terms. However, in defining these terms it is usually necessary to go beyond stating where a term belongs in a taxonomy. We need some means of identifying it; so the text uses identifying clauses to form definitions, e.g. *clouds are collections of water droplets*; *the top storey of the rainforest is called the canopy*. Now, such definitions may involve a long chain of descriptions:

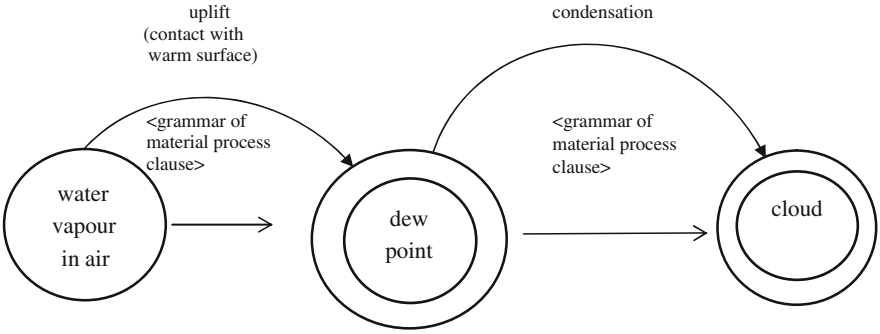
Text 5.6

After flash floods, desert streams flowing from upland areas carry heavy loads of silt, sand and rock fragments. As they reach the flatter area of desert basins, they lose speed and their waters may also soak quickly into the basin floor. The streams then drop their loads, the heaviest materials first – the stones – then the sand and finally the silt. Choked by their own deposits, these short-lived streams frequently divide into a maze of channels, spreading their load in all directions. In time, fan- or cone-shaped deposits of gravel, sand, silt and clay are formed around each valley or canyon outlet.

These are called **alluvial fans**.

At this point, as Wignell remarks, you are not merely saying what a thing is; you are saying how it got to be the way it is. Now, you can **see** an alluvial fan—at least, in a picture taken from the air; but with technical terms for concepts less accessible to the senses, especially those involving grammatical metaphor as nominalizations of processes (e.g. *condensation, evaporation*), it is necessary to provide a chain of **explanations**. Thus, the example in 5.1 was actually a **definition** of the technical term *convective uplift.* Note that *dew point, condensation* and *cloud* have already been defined; they are then used in the definition of *convective uplift.*

Wignell calls these complex causal chains **implication sequences** and analyses them (using systemic grammar and transition networks) into a series of stages, each two stages being linked by one or more processes.



The processes linking the various stages are expressed in material process clauses *air will become heated* causing it to *rise*, etc.; the summaries defining the terms at each stage such as *clouds are collections of water droplets* are identifying clauses. Our Year 7 maths textbook displays a more or less identical structure.

Text 5.7

Any set F of ordered pairs is a *relation*.
The set X of all first components of F is called the *domain* of F.
The set Y of all second components is called the *range* of F.
A *function* is a relation wherein each element in its domain is matched in an ordered pair with one and only one element of its range.

Wignell finds a closely similar pattern at a more advanced level in a college textbook:

Text 5.8

As air is moved upwards away from the land/water surface, or downwards towards it, very important changes occur in the air temperature.

Air moving upwards away from the surface comes under lower pressure, because there is less weight of the atmosphere upon it, so it stretches, or expands. Air moving downwards towards the surface encounters higher pressures, and shrinks in volume. Even when there is no addition or withdrawal of heat from surrounding sources, the temperature of the upwards or downwards moving air changes because of its expansion and contraction.

This type of temperature change which results from internal processes alone is called *adiabatic change*.

Wignell's coresearcher Suzanne Eggins has been studying the forms of the definitions themselves and suggests that this is one of the main sources of grammatical metaphor in secondary school textbooks. She finds that in academic writing, at least, grammatical metaphor plays a fundamental role both in creating and in defining technical terms.

Wignell and Eggins are examining the construction of thematic systems in a science subject, and the question might be raised whether the same kind of pattern is established in the learning of other non-science subjects in the secondary school. Their project is in fact comparing geography, history, and literature as these are learnt in Years 7 and 8. Clearly, the structures of interlocking technical terms are particularly characteristic of science; but the use of definitions and the use of grammatical metaphor in general to create a technical discourse for the subject are features which appear to be characteristic of all subject registers. The forms of written English which I described in an earlier lecture, looking into the history of scientific writing, are features of the language of learning as a whole; they are present in the academic discourse of all disciplines, and hence appear in the textbooks, which are the route whereby the learner gains access to this kind of discourse.

But such features are much less present in speech, so this tends to create a fairly wide gap between the spoken and the written forms. So I would like to give one final example, using a transcript of a spoken lesson and comparing it with a written paper on the same topic: (from Tim Johns, University of Birmingham) (a) is the written version, (b) is the teacher's spoken version.

Text 5.9

(a) A total head range in the reservoir of less than 10 m was inadequate to account for this variation. However, equation (3) provided a satisfactory explanation of the observed variation. A β value of 0.0045 m a day^{-1} served to minimize the sum of the unknowns. This figure accords well with the seepage estimate of an equivalent drop in reservoir level of 4.2 mm day^{-1} derived by Holmes et al. (1981) using a shorter database.

(b) We could calculate the surface area of the reservoir, and we related the surface area to the – to seepage by a very simple equation, where seepage was nought point nought four five times surface area. In other words, it was the surface – this is all in metres

> again, cubic metres I should say – the surface area in square metres multiplied by in effect four and a half millimetres per day. So seepage was equivalent, if there were no inflows, if there were no outflows, if there was no evaporation off the reservoir, the reservoir level would go down by four and a half millimetres every day. So empty, very quickly.

Here, at the upper end of the school, we see once again the rather dramatic difference between writing and talking:

> *This figure accords well with the seepage estimate of an equivalent drop in reservoir level of 4.2 mm day^{-1}.*
>
> versus
>
> *So if there were no inflows, if there were no outflows and if there was no evaporation off the reservoir, the reservoir level would go down by four and a half millimetres everyday. So empty, very quickly.*

If the lecturer had been talking to a Year 7 class, he would probably have said something like this:

> *If no water flowed into the reservoir, if no water flowed out, and if no water evaporated from it, the water would still get lower by 4½ mm every day.*

—removing a little more of the grammatical metaphor: *if no water flowed in*, rather than *if there were no inflows*. But these two spoken versions would still be more similar to each other than the more advanced spoken one is to the written.

So the student entering into the secondary school is entering a new phase, which is going to make new demands on his language resources. He has to learn the language of the disciplines. And this we have now seen has two major properties:

1. it is highly metaphorical and
2. it is highly variable

Metaphorical, not in the sense of lexical metaphors, which are there in all forms of discourse, but of grammatical metaphors. Variable, not only in the variation between subjects (that of field) but also in the variation between the different learning environments (textbook, teacher talk, library research, homework and so on—tenor and mode). In both these respects, the learner is again becoming more mature. Labov showed in his New York studies in the 1960s that it was only after age 12–13 children became sensitive to the social significance of dialect variation; at the same time, and by the same token, they become aware of the functional significance of register variation and can be expected to produce themselves the forms of written and spoken discourse that are functional with respect to the occasion (Labov 1966). And we have seen that they can normally be expected to be gaining control over grammatical metaphor at this age, even if they cannot always decode the metaphors they meet in the textbooks, like one I quoted earlier:

Braking distance increases more rapidly at high speeds

—which figured in a Year 8 mathematics textbook. How much of their learning is explicitly learning a **language** becomes obvious from a scrutiny of any one of the textbooks I have been citing, for example from Year 7 mathematics:

> In many algebra books you will see numerals like "−6". This means, of course, the *opposite of* 6, that is, the *opposite of positive* 6. Thus −6 is exactly the same number as *negative six* or −6.

It was said many years ago—someone has traced it back to a report drawn up in England in 1926, and no doubt that was not the first time—that every teacher is a teacher of language, and this is perhaps another way of saying that all learning is a linguistic process. I think it is helpful for **all** teachers to know something about the nature of language, and how it is used—how it is used in their own particular discipline and how it is used as the medium with which we learn. But the language specialist, in the secondary school, will always be the teacher of the language that is the main medium of education. He is the only one that can be expected to have an overview of the varieties of language that the pupils are required to master.

In focusing more on scientific subjects, I am not suggesting any kind of educational priorities. It is necessary to choose some area for purposes of offering an interpretation of language and learning, and as I have been approaching this topic from many angles, I had to have some means of focusing the discussion. Some of the features that I wanted to examine appear more obviously, perhaps, in the discourses of science, and one can trace their evolution more readily in this context —or at least I have been able to do so. But the concept of language and learning covers the whole range of learning, both inside and outside the educational system, and in choosing to illustrate from science, I am not implying any disrespect to literature or to history—or, obviously, to the study of language itself. Indeed, my emphasis has been on what is common among the various disciplines. After all, it is the same children, in the secondary school, who are studying chemistry as are studying history or literature, and even if they each have strong preferences one way or the other, the value they get from any of their subjects depends on the fact that the language is being used for them all.

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Chapter 6
English and Chinese: Similarities and Differences

I have been trying in these lectures to build up a picture of how we—that is, people, human beings—use language to learn, and perhaps I might summarize, briefly, the perspective that I have tried to adopt. In the first place, I take 'using language to learn' to be something of a tautology: 'how people learn' would do just as well, since when we learn we are, in fact, using language. Even when we are not for the moment employing any of the four language skills, the categories and the patterns we are using to make sense of our experience—all the notions that we have of objects, events, qualities of things, abstractions and so on—are all semantic categories: they have evolved as part of language, and they get their meaning from being part of language. So in introducing these talks, I used the words 'a linguistic interpretation of how people learn'.

Then secondly, I have tried to approach this question from a number of different directions: developmental, historical and educational. I traced the development of language in early childhood, again from the point of view of how babies and small children use language to learn, which they do by thinking about and acting on their environment through interaction with other people in language. I looked into the history of the language of learning, in the other area of learning (but of course the two are closely related), namely the language of scholarship; so, the evolution of English as a language of science. And I attempted to bring these two different lines of approach together at the point where the two streams do in fact meet, namely in the language of education, asking how children then go on to **use** language in the course of their own schooling: first in primary school, with initial literacy and the emergence of the linguistic styles of the classroom—the 'curriculum genres', as Frances Christie describes them, and then in secondary school as they move into the subject disciplines and master the discourse of mathematics, geography, literature and so on (Christie 1988). Again I used the language of learning science as the main source; not intending thereby to privilege science over other areas of scholarship and educational knowledge, but (since I had to be selective) choosing science because in the history of Western thought, during the period in which English and the other European languages have been taking on their roles in education and scholarship, the natural sciences, especially the physical sciences, have tended to lead the way in shaping the patterns of discourse.

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Now, I shall move to yet another vantage point, this time a comparative one: comparative in the linguistic sense, in that I should like to look at English in comparison with another language, namely Chinese. In talking about Chinese, I shall be referring specifically to Mandarin; if I want to refer to other varieties of Chinese, I shall name the dialect—Cantonese, Hokkien and so on—although much of what I have to say would be equally valid for all forms of Chinese. I shall still be keeping English in the picture, but using it now as a starting point from which to think about Chinese; and this, I hope, will have a twofold effect, since it should also lead us to think again about English, to **problematize** it and to reflect on these aspects of it which become noticeable if you approach English from the Chinese end instead of just taking it for granted as a kind of norm for all human speech. Linguists have always tended to fall into one of two camps: those who think that languages differ only on the surface, so that if you dig deeply enough into their grammars, they are all alike underneath; those who think that the differences are not just in outward appearance but that languages also display rather fundamentally different ways of meaning. My own view is perhaps a kind of compromise: I do think that there are deep and significant semantic differences between languages; but I also think that all languages operate within a common overall semantic space, so as to speak, so that what we have to try to understand is the nature of this space—and of the variation that is possible within it. I shall not be talking at this very theoretical level today; but I thought it might be helpful to give some brief indication of how I view this particular issue.

So let me begin with the babies again and refer first of all to the protolanguage phase in the first year or year and a quarter of life: roughly up to the time when a child is starting to walk. At this stage, before they start learning their mother tongue, infants typically create for themselves a 'child tongue': that is, a little language that they share with those around them—they use it, and their caregivers understand it—and which they use as their way of starting to explore and to control the world. Psychologists call this stage the period of secondary inter-subjectivity. We refer to it in linguistic theory as a 'protolanguage': 'language' because it functions as a language, to think with and to act with, and because it is structured out of meanings coded into expressions (i.e. it is symbolic); 'proto-' because it differs from adult languages in one highly significant respect—it has no grammar, and therefore no words (no 'lexicogrammar', to use the fully explicit term). The protolanguage probably represents an earlier phase in the evolution of human language, a phase before the system evolved from one of just two levels to one of three levels as all languages are today.

I mentioned earlier the work of a Chinese colleague Qiu Shijin 裘世瑾, who has studied the early language development of a group of Chinese children growing up in Shanghai (Qiu 1985). Out of her eighteen subjects, four were aged between eight and fifteen months. Qiu Shijin investigated their patterns of communication and found that, like the English and Australian children, they created signs of their own and used these signs across the same range of functions: to get what they wanted, or reject what they did not want; to order people about ('do that again!' and so on); to initiate and respond to interaction, including interaction through shared experience

('let's look at this picture together', and so on); and to express their reaction to the world—interest, pleasure, surprise, disgust and so on. Here is Qiu's summary:

> Evidence has shown that in Phase I both the English and my Chinese subjects all create their own meaning potential, and the meanings they create can be derived from certain functions. It is these functions of language – instrumental, regulatory, interactional, personal, imaginative – on which the children base the 'signs' of their own protolanguage.

These signs are **not** words; they are not yet Chinese, just as those of the children of English background were not yet English, and you could not tell from the sounds used what the language is that the child is hearing around. Thus as a general demand (for objects), Nigel typically says nànànà; Hal says mā; Zhiying says māmà; Hanyun says nɛ̰. As a request for goods and services, 'do something!', Nigel says ʒ̃; Hal says ʔə̰; Zhiying says nènè; Hanyun says ŋ̃ ŋ̃ and so on. If you hear one of these sounds, on tape, you can make a reasonable guess at what it **means**; but you **cannot** tell whether the child's language environment is English or Chinese.

When the children come to make the transition into the mother tongue, Qiu again finds important similarities between the English-speaking and the Chinese-speaking children. Both groups take as their basic strategy for this next stage the distinction between utterances of a pragmatic kind, meaning 'do something', or (later also) 'say something'—in other words these utterances which always demand a response, and those of an observational kind, commenting on an object or event, which are interpretations of experience and demand **no** response—although they may get one, confirming the child's interpretation or else correcting it. At first, the particular words and structures that the children are learning are confined to just one or other of these ways of meaning—the same items are not used in both. Furthermore with all the children observed—English and Chinese—the pragmatic is the marked option; pragmatic utterances carry a special voice quality (Qiu says "the pragmatic utterances are usually loud and tense, while the mathetic ones are usually soft and lax"). Gradually towards the end of the second year of the child's life, the grammar of the mother tongue takes over, with the familiar clause patterns of transitivity, mood and theme, and the Chinese children, now speaking Chinese, are able to construct clauses combining the two basic metafunctions of thinking and doing just as are the English and Australian children who are now speaking English. There are differences among the individual children, in the rate at which they learn, and in their orientation to different topics and different functions. But there were no significant differences between the Chinese children and the English children taking these two groups as a whole.

So the way in, the mode of entry into language (and therefore into learning), is essentially the same whether the language spoken around is English or Chinese, and it is probably very much the same the world over. I remember once walking along the street in Alice Springs and hearing a small child behind me, making protolinguistic sounds to whoever was looking after him, and it was only when I heard the mother's response, which was in Aranda, that I realized this was an Aboriginal child. It is likely that children's early experience of language and learning differs rather little from one human group to another.

Now I wanted to bring out this point about the beginning of language; I do not propose to follow through the later language development of these Chinese children; it would take far too long. What I want to do is to make certain comparisons between Chinese and English which will bring Chinese into focus in relation to some of the general features I have been describing with reference to English. But in doing so, I will keep roughly to a developmental perspective, since that will provide the content—I can refer to the same concepts and principles as established before.

Let me look next, then, at the principle of generalization—the general-specific dimension of meaning, since as we have seen that is a necessary condition for learning any language at all—and in fact for any kind of organization of our experience. Now, all languages are based on the principle of 'common' reference (as in 'common noun'): thus, all lexical items other than proper names are 'common' terms in this sense—they refer to classes, not to individuals. So whether we say *pencil* in English or *qiānbǐ* in Chinese, this refers to a whole class of objects: it is a common noun, not a proper noun. And in all languages, some classes include other classes, so many of the words form taxonomies; and one of the first steps in learning a first language is to construct the appropriate taxonomies—to learn that there are different kinds of writing implements, different kinds of clothes, different kinds of animal, different kinds of colour and so on. If we look more closely into this, we find it reveals an interesting difference between English and Chinese.

Text 6.1 illustrated a dialogue between Fang, who is 19 months, and her father.

Her father says to her:

Wáwá shénme yánsè? (what colour is the doll? 娃娃什麼 顏色?)
Fang replies: hóng yánsè. (red colour 紅顏色)
Father: Jīmù shénme yánsè (what colour are the building blocks? 積木什麼 顏色?)
Fang replies: lǜ yánsè (green colour 綠顏色)

Text 6.1

Father:	Wáwá	shénme	yánsè?
	Doll	What	colour
Fang:	Hóng	yánsè.	
	Red	colour	
Father:	Jīmù	shénme	yánsè?
	Bricks	what	colour
Fang:	Lǜ	yánsè.	
	Green	colour	

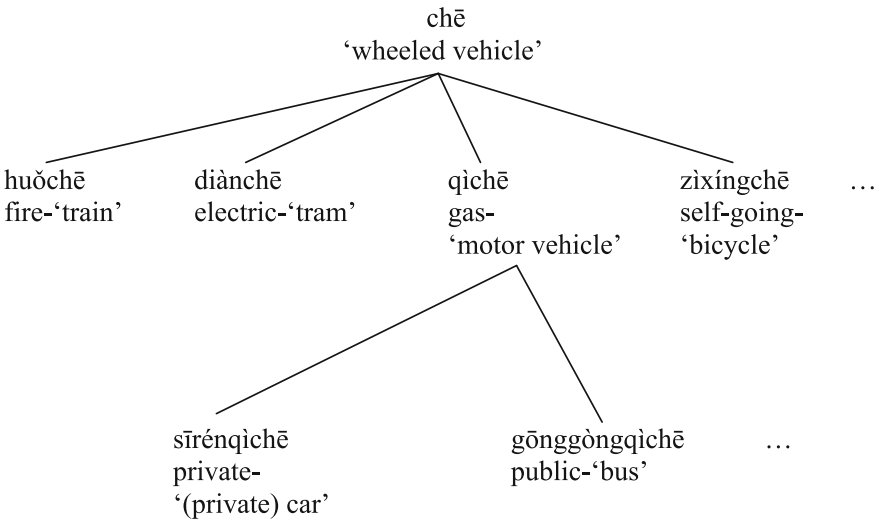
It is not obligatory in Chinese to say hóng yánsè ('red coloured'), but it is quite common. What this does is to make it explicit that red is a kind of colour.

Similarly, Fang's father asks her: *Zhè shénme dōngxī?* ('What's this?') She replies: *gōnggòng qìchē* ('It's a bus'). Now, the word for bus, as used in China, contains the element *chē*. So does train (*huǒchē*), bicycle (*zìxíngchē*), tram (*diànchē*) and so on. Again, Chinese makes it explicit that these words are all 'cohyponyms' (related by superordination)—that is, kinds of one and the same

more general class. Moreover, the element that signals this relationship *chē* is also the name of the more general class. So as a 'superordinate' term for *huǒchē*, *diànchē*, *zìxíngchē*, *gōnggòng qìchē* and so on, you have the more general word *chē*, meaning 'wheeled vehicle'.

We noted already the different situation that arises in English when Nigel was playing with his toys, holding a bus in one hand and a train in the other. In the first place, the words *bus* and *train* give no indication that they are both kinds of some more general class; secondly, there is no name for that more general class, so when Nigel tried to **count** his buses and his trains, using his newly learnt meaning *two* (two of a kind), he was defeated—two what? He wanted to make them members of a class; but the language got in the way. In Chinese, they would have been two *chē*. And with the bus, of course, there is even more taxonomic organization in Chinese; because a gōnggòngqìchē is not just a kind of *chē*, it is a kind of *qìchē*, and a *qìchē* is a kind of *chē*:

Text 6.2 (a)



This principle, by which the taxonomy of objects is made explicit in the morphology of the noun compound, is very widely used in Chinese. So when Chinese children start to learn the names of fishes, they all end in *yú*—which is also the general word for 'fish'; flowers all end in *huā*; trees all end in *shù* and so on. In English, some do and others do not, and with others yet again it is optional—so we have *gemfish*, *crayfish*, *cuttlefish* and *catfish*, which always contain *fish*; *herring*, *halibut*, *carp*, *sole* and *salmon*, which never do; and a few like *cod*, or *codfish*, which may or else may not. (Those that have to add *fish* include those where to

leave it off would mean something else; you obviously cannot call a catfish just a cat. Similarly, a peartree has to be called a *peartree* to distinguish it from a pear; with other trees, such as *oak* or *oaktree*, *pine* or *pinetre*e, the *tree* is optional.)

Thus, the fact that the objects around us are organized into classes, and classes of classes, is made explicit in the ordinary everyday vocabulary of Chinese. As another example, *qiānbǐ gāngbǐ zìláishuǐbǐ yuánzhūbǐ* are all kinds of *bǐ*. The Chinese compounds rarely play tricks with you; if a word ends in *chē*, you can be almost certain it is a kind of *chē*. There are very few metaphorical ones, like *shoetree/boottree* in English, which is not in fact a kind of tree. The same principle is then built on, in the creation of technical and scientific terms: thus, any kind of a machine is likely to end in jī:

Text 6.2 (b)

fēijī	Nèiránjī	tuōlājī	jìsuànjī	dǎzìjī	…
flying-aeroplane	inside-burning internal combustion engine	(hauling-) tractor	calculating-computer	character-striking-typewriter	

There is thus a kind of symbolic continuity between the natural world of common-sense knowledge and experience and the world of human artefacts and technology, a continuity which may be rather more obvious in Chinese than it is in English. We will come back to this more technical language later on; meanwhile, let me next move a little further up the age range to the time when children start learning to read and write. Let us consider some of the features of Chinese writing, again from the standpoint of the learner and in comparison with English.

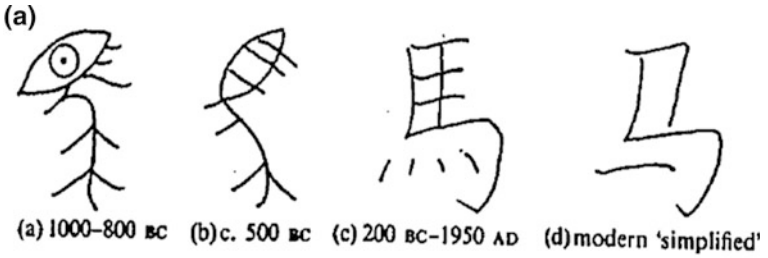
When the European scholars in the sixteenth century first came to know about Chinese writing, they were extremely impressed by it. The Elizabethan linguist Timothy Bright, inventor of shorthand, studied the Chinese charactery and realised that the principle on which it was based was a logographic one—'each character answereth a word', as he put it. Because the symbols stand for words, not sounds, they are not tied to any particular sound system; hence, the European scholars took them as a model, hoping to use the principle of a charactery in designing universal writing systems. Latin had ceased to be used as the main language of scholarship; scholars were writing in their own vernacular languages and were attracted to the idea of a writing system that was neutral—that could be used equally well to write English, French, German, Italian or any other language. Various such systems were developed, the most famous (and most complete) being that of John Wilkins, who was a contemporary of Newton; but by Wilkins' time, the aims had become more ambitious, and so further removed from the original source of inspiration in Chinese characters. What Wilkins was inventing, in fact, was not only a system of written symbols but also a whole new artificial language to go with them, and the written **symbols** did not look anything like Chinese. But the language he invented to go with them was based on a **logical** schema like that of the Chinese compound words we have just been discussing: the words formed morphologically related sets—and each **character** contained all the elements of the compound, both general and

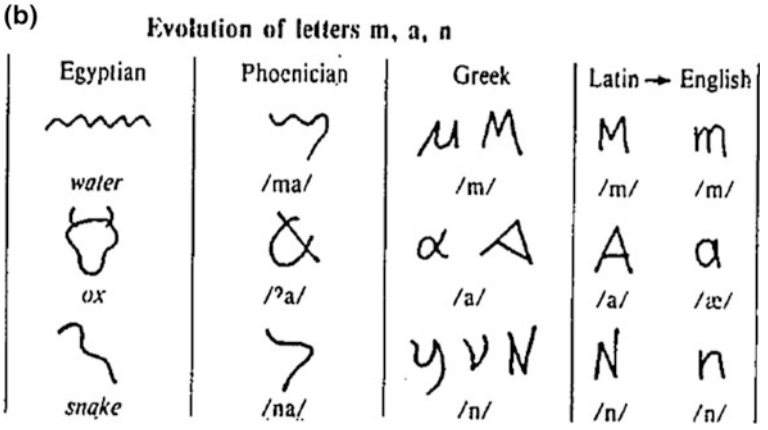
specific. None of these invented languages or writing systems was ever used; but the effort expended on them was not wasted because in the process, these scholars threw a great deal of light on the structure of natural languages such as English. And the interest in Chinese was always maintained.

What was not maintained, however, was Timothy Bright's original insight into the nature of Chinese characters. He wrote that a character stands for a word, and since he was considering classical Chinese that is substantially accurate. For modern Chinese, we have to modify this a little and say that each character stands for a **morpheme**, since the words of modern Chinese typically consist of more than one morpheme, and such words are written with more than one character. But the basic principle of the script has not changed; the Chinese script is logographic—it represents the language not at the level of **sound**, as English writing does, but at the level of **wording**. While English letters (the letters of the English alphabet) stand, in principle, for phonemes, Chinese characters stand, in principle (and most of the time also in practice), for morphemes.

They do not stand for ideas; Chinese writing is logographic, but it is not ideographic. This is something that is widely misunderstood. In their shape, of course, many Chinese characters were originally pictures; but so were the letters of the English alphabet, and in neither case has that anything to do with their function in the language today. Text 6.3 (a) and (b) shows the evolution of a Chinese character 馬 'horse' and of the three English letters *m a n*.

Text 6.3 (a) and (b)





The English letters stand for sounds /m/ /æ/ /n/; the Chinese character stands for the **word** *mǎ* (which happens to consist of one morpheme, so it only needs one character). If we want to write, say, *máquè* 'a sparrow', we have to write two characters 麻雀—not because a sparrow is bigger than a horse, or consists of two parts, but simply because the **word** for sparrow consists of two morphemes. If Chinese characters were ideographic, then we could take a character and use it for a whole array of synonyms, for example: suppose we write the character for 恨 'hate'—we could then read it *hèn* or *tǎoyàn* or *bù xǐhuān* or *bú ài* because all these represent more or less the same idea; but of course we cannot—we can only read it *hèn*, because it stands for the **word** *hèn*, not the idea behind it. It is important to clear this kind of misunderstanding out of the way.

When a Chinese child learns to read and write, therefore, he is doing exactly what the English-speaking child is doing: learning to represent his language in a new medium. Chinese writing is not better, or worse, or more primitive, or more advanced than English; it is just different. (It happens to suit the Chinese language, for a variety of reasons which are hard to express without going into technical details; but which have to do with the fact that the morphemes of Chinese are highly invariant—they do not change their phonetic shape in different contexts, as those of many other languages do.) But since there are far more morphemes in a language than there are phonemes, there are a very large number of Chinese characters and the child has to put a lot of effort into learning them—though given that he already knows the language it is not an insurmountable task.

I have often been asked the question: Does the nature of Chinese writing mean that one learns differently, and thinks differently, in Chinese from the way one learns or thinks in English? I think not. If there are differences, between learning in Chinese and learning in English, these are due to the nature of the two **languages** (their different grammars), not to their different writing systems. (Again I think the question is raised largely because of the mistaken notion that Chinese writing is ideographic.) If you speak Chinese, you can think and learn in Chinese; and this will still be true if you are a small child not yet literate, or an older person but not literate in Chinese; and it would still be true if Chinese ever came to be entirely written in pīnyīn—roman transcription, as apparently the Chinese edition of the Encyclopaedia Britannica is. There are certain **indirect** effects of the writing system —for example, with a logographic script it is possible for the written language to diverge much more widely from the spoken one, as happened throughout many centuries of Chinese history, and this in turn certainly affected the whole pattern of Chinese education; but this divergence is no longer true today, when the written language is also the standard spoken language, Mandarin. In this connection, the main consequence of the logographic nature of the writing system is simply that it makes it rather harder to learn the standard language for a child who does not know it already, since while the character tells you unambiguously which **word** is being symbolized, it gives you no indication how that word is to be pronounced. So if a child who speaks only a southern dialect has to learn Mandarin at the same time as becoming literate, it helps to have a form of transcription, like pinyin, available. But this is now moving rather far away from my main concern.

So let us return to the nature of the Chinese **language**, and consider it now as a way of learning about the world, as a general account of human experience. Clearly, the basic grammatical resources of Chinese are very much the same as those of English. The clause, in Chinese grammar, is clearly recognizable as a grammatical unit, as is that of English, and like that of English, it is organized around the three metafunctions I referred to in an earlier lecture—in systems of transitivity, mood and theme. That is to say, the clause functions simultaneously (1) as a representation of experience, with the same basic theory of process types (material processes, mental processes and relations); (2) as a means of interaction, for making statements, questions, commands, offers and all the many thousands of varieties of these; and (3) as a means of constructing a message, organizing the discourse into quanta of information each starting with a theme, or point of departure, and having **somewhere**—typically but not always at the end—a main point which is the part that contains the news.

Text 6.4

	現代翻譯學 Xiàndài fānyìxué modern translation theory	正在建立 zhèng zài jiànlì is just establishing	自己的科學體系 zìjǐde kēxué tǐxì its own scientific system	
(transitivity)	Actor	Process	Goal	[material process]
(mood)	Subject	Predicator	Complement	[declarative function]
(theme/information)	Theme		New	

(This happens to be taken from a piece of scholarly writing; I could just as well have used a clause of the everyday language like 張三蓋新房子 'Zhang San is building a new house'.) And the clauses combine with each other, into logical-semantic complexes, in ways that are parallel to the complexes that are formed in English.

A Chinese child, therefore, using Chinese to interpret his experiences, will come out with a picture of the world that is quite compatible in its essentials with that of an English-speaking child. Whether you learn your (primary) school subjects in English or in Chinese will not make any significant difference to your understanding of those subjects—of geography or maths or natural science. But there are at the same time some interesting differences in the grammars of the two languages; and these could perhaps suggest some different ways of looking at things: so let me say a word about just two of these.

One concerns **time**. English represents time in the form of **tense**: that is, past, present or future, and this is chosen, in the first instance, with reference to the moment of speaking—it rained (earlier), it is raining (now) and it will rain (later on). One can then add a secondary tense taking the first one as a point of reference: *I thought it was going to rain today; it probably will have rained by tomorrow night*

and so on. Chinese represents time in the form of **aspect**, which has to do not with a time reference of past, present and future but with an opposition between a process that is completed and one that is not completed; or rather, more accurately, between a process whose significance lies in its completion, and often therefore in its consequences, and one whose significance lies rather in itself: for example the difference between (1) 門開著 *mén kāi zhe* / 開著門 *kāi zhe mén* and (2) 門開了 *mén kāi le* / 開了門 *kāi le mén*; 'door + open' in imperfective aspect and in perfective aspect. If I say 開著門 *kāi zhe mén* 'the door being open', that is the state of affairs, or the thing that matters; for example simply 門開著 *mén kāi zhe* 'the door's open', or 他開著門睡覺 *tā kāi zhe mén shuì jiào* 'he sleeps with the door open'. If I say 開了門 *kāi le mén*—that is 'having opened the door, the door being opened'—here what matters is the completion of the process: 門 開了*mén kāi le*—'the door's been opened', or else its consequences 他們開了門就逃走了 *tāmén kāile mén jiù táozǒu le* 'they opened the door and escaped/fled', or 門開了我們才可以 進去 *mén kāile wǒmén cái kéyǐ jìnqù* 'when the door's open we can go in' (or 'we can't go in until the door's been opened'). In other words, Chinese is more concerned with the aspect or phase of a process: whether it is complete or not, successful or not, important for itself or for its consequences, and less with its location on a time scale as either before, or at, or after some point of reference. As another example, in English, we say simply *I can't see …* e.g. *I can't see the moon now*; Chinese is concerned with in what way the process is unsuccessful, e.g. 看不見 *kàn bú jiàn* 'it's out of sight', 看不到 *kàn bú dào* 'I can't see that far', 看不出來 *kàn bú chūlái* 'I can't make it out' 看不清楚 *kàn bú qīngchǔ* 'I can't see it clearly' and so on. Of course, each language can construct forms for representing these contrasts from the other by lexical means; but they are not necessary parts of the meanings that are expressed—they are not **coded**, as we say, in the grammar.

As a second example [distantly related to the last], Chinese does not make a grammatical distinction between finite and non-finite predications. In English, only finite predications can function as speech acts and be argued about. If I say (borrowing the last example) 'I can see the moon'—I've told you something and you can argue with me about it, comment on it and so on: 'no you can't!' 'can you really?' 'I thought so'; whereas if I say 'seeing the moon' you have to wait for (or supply) something else, e.g. 'Seeing the moon, Newton wondered why it didn't fly off into space'. Chinese makes no such distinction. This makes it hard to translate Chinese lyric poetry into English: because in English, you always have to choose one or the other and that is precisely what the Chinese is not doing. So if I want to translate the famous line of Chinese poetry 舉頭望明月 *jǔtóu wàng míngyuè*, I have to decide between 'I look at the bright moon' and 'looking at the bright moon'. But the Chinese is not in fact saying either, because the distinction is not present in Chinese grammar. This has some implications for the language of science and philosophy, because it gives the Chinese clause a kind of neutrality that you can achieve in English only by nominalizing. So if I say for example 氫氣變成氦氣 *qīngqì biànchéng hàiqì* 'hydrogen turn into helium', it may be an assertive proposition 'turns into', or a hypothesis 'if … turns into', or simply non-finite 'for hydrogen to turn into helium' and so on. This effect is achieved in English only by

nominalizing: 'the conversion of hydrogen to helium', whereas in Chinese, it is a feature of the expression even when it is embodied in a predication. In English, unless you deprive the thing of its **status** as a process, in this way, by nominalizing it, you cannot talk about a process without at the same time giving it an explicit value in the speech function—dependent, hypothetical, assertive and so on. In Chinese its speech function is of course derivable from the context; but it is additional to rather than inherent in the process itself.

Let me attempt a summary of the features I have referred to. Looked at from the English angle, Chinese organizes its names of things rather strictly and explicitly into taxonomic sets (by compounding); there are words for the general categories, and the general terms are usually used where that is enough to make the meaning clear (whereas with actions and events, the tendency is to prefer the more specific term). In representing processes, Chinese is concerned with the aspects and phases of a process—completeness, consequences, success or failure; but not with its timing, relative to the observer, or with whether or not it has determinate status as a speech act.

Looked at from the Chinese angle, English tends to be inexplicit about how objects are classified into taxonomies, and to operate at a rather specific level, often lacking general terms (whereas its representation of actions and events is much more generalized). In talking about processes, English assigns each one a determinate place on a time scale, but typically ignores its aspects and its phases; and it makes explicit whether the process has its own speech function, and if so, what that speech function is.

I do not think that these differences imply that Chinese and English engender different thought processes. To use the formulation I suggested at the start, they are taking up somewhat different options within the same general semantic space. But I think there is a great deal that still needs to be explored here, and I shall take up the point briefly in a different context in a subsequent lecture. It is possible that for a learner—for example in science—the two languages could embody slightly different assumptions about the nature of reality (more different than, say, those of English and Italian, or of Chinese and Thai) and that this might create a greater distance, for a child in a Chinese-speaking home in, say, Australia, between the common-sense learning that takes place in Chinese and the educational learning that is taking place in English. But I doubt that this could ever be a significant factor in educational success or failure.

Chinese has been a language of scholarship, including technology and science, for a very great period of time (2000+ years). Following Needham's monumental publication, *Science and Civilization in China*, there is work for generations of researchers in exploring the history of Chinese science, which will include, I hope, a history of scientific Chinese, the language in which it is codified (Needham 1978–1995). Here, there was of course a major discontinuity, as literary Chinese (文言 wényán) continued to be used up to the end of the nineteenth century, and when the medium switched to modern Chinese, many of the early materials to appear were

translations from English and other European languages, and this no doubt had some impact on the language of Chinese scientific writing. Now, of course, there is a huge output of papers, in science, social science and humanities, written as original publications in Chinese; but meanwhile science has become world science, so it is unlikely that Chinese and English will now grow further apart. But in the light of the features we have found to be characteristic of scientific discourse in English, it is I think of interest to ask how far that of Chinese may be found to display similar features.

There is one particular point that I referred to in passing in an earlier lecture, which can now be seen to be an instance of one of the general properties of Chinese I have already been talking about. In English learned terminology, we typically confuse the name of a phenomenon with the name of the study of that phenomenon: for example, we say 'the phonetics of English is very complicated' 英語的語音很複雜 *yīngyǔ de yǔyīn hěn fùzá*. We also say 'I'm studying phonetics' 我 研究語音學 *wǒ yánjiū yǔyīnxué*. So 'phonetics' in English has to do duty for both 語音 *yǔyīn* and 語音學 *yǔyīnxué*, and the expression *English phonetics* is entirely ambiguous: it could mean either 英語的語音 *yīngyǔ de yǔyīn* 'the sounds of English', or 英國的語音學 *yīngguó de yǔyīnxué* 'phonetics (the study of phonetics) in England'. It is even worse when we put an 'ology' on to something, in order to mean the study of it and then forget that it is there, using the word to refer to the phenomenon itself. For example, *psychology*: psychology means 'the study of the psyche', 心理學 *xīnlǐxué*. But we talk about a person's psychology to mean their mental makeup, or we refer to *criminal psychology*, where we really mean the criminal psyche—罪犯的心理 *zuìfàn de xīnlǐ* not 罪犯的心理學 *zuìfàn de xīnlǐxué*! Chinese keeps such pairs clearly distinct, and we can now understand why: it is simply another instance of the explicit taxonomic structure of Chinese nominal compounds.

We can then ask whether this property that we found to be a feature of ordinary everyday Chinese is retained in the structure of **technical** terminology in general, in scientific and other forms of learned language. It turns out, in fact, that it is. Chinese technical terminology tends to be highly systematic, and also very **transparent** to a Chinese learner. But this also depends on another feature of the language, namely that Chinese does not borrow. Chinese is not a **borrowing** language. It prefers to draw on its own historical sources.

Let us clarify one thing first of all: there is nothing to be ashamed of in borrowing, at least linguistically. If you borrow money, you have to give it back, usually with considerable interest. If you borrow words, you do not have to pay them back, and you can always come back and ask for more. Some language planners, in certain countries, have tried hard to stem the tide of borrowing, as if there was some national disgrace involved; but the simple fact is that some languages borrow and others do not—that is just the way they are. So English, for example, and Japanese are borrowing languages; they will take in words from anywhere and domesticate them. Chinese is not a borrowing language; it is hard to

make foreign words fit into the very tight phonology of Chinese syllables, and there are other difficulties besides that. Chinese of course takes in material from other languages; but it does so by a different process known as *calquing* (詞語仿造 *cíyǔ fǎngzào*).

Whether or **not** under the influence of another language, Chinese creates new terms out of its own classical roots, with the result that it is very obvious what they mean. Let me just give some examples from the terminology of linguistics. As soon as you see the Chinese, 語言錯亂 (*yǔyán cuòluàn*), it becomes clear what *paraphasia* means in English—i.e. producing unintended syllables, words or phrases. I can even construct new terms in Chinese with a reasonable chance of getting them right; for instance, I do not know what *paragrammatism* is in Chinese, but I might risk語法錯亂 (*yǔfǎ cuòluàn*). Both *paraphasia* and *paragrammatism* are kinds of disorder (錯亂 *cuòluàn*). You may not be able to process them all in speech; but since the writing is logographic, as soon as you see them in writing they are clear. This works greatly to the advantage of a Chinese learner, a secondary pupil; while his English counterpart is struggling with the unfamiliar (and often unpronounceable) roots from Latin and Greek, the Chinese learner is dealing with largely familiar words, or (even if they are from classical Chinese) with words that fit easily into the patterns of the modern language. And the principles on which these are constructed, to form the very complicated configurations of technical terms that he has to learn, are simply those he has been familiar with since childhood. There is no complex morphology to deal with such as that needed to produce sets of words in English such as paralyse, paralysis, paralytic and so on. Thus, the learner in a Chinese classroom has his tasks simplified as far as the **terminology** is concerned.

When it comes to the syntax, on the other hand, there is one feature of Chinese that can be a source of some complexity and may make a text more difficult to follow. This is the general principle of Chinese grammar whereby all modifying elements always precede what they modify. Let me illustrate what this means, by contrasting it with English.

In an English nominal group, some of the modifying elements come before the noun and some come after it. So we can say *a cow is a strong friendly animal with four legs that eats grass*. Adjectives come before the noun Head, prepositional phrases and clauses come after. Furthermore, we can often turn one into the other: we can say either *a cow is an animal with four legs* or *a cow is a four-legged animal*, and while this does not matter very much if that is all we are saying about it, if there are a lot of other modifiers then this helps to balance them out: *a cow is a strong friendly animal with four legs*, or *a cow is a four-legged animal that eats grass*. In Chinese, there is no choice; all such elements precede the head:

niú shi yígè qiángzhuàngde kěài de chī cǎo de sì tiáo tuǐ de ***dòngwù***
cow is one strong friendly eat grass four-legged animal

So from an elementary bilingual mathematics textbook, I noted the following:

Text 6.5

duōbiānxíng	shì	yígè	yǒu	sān tiáo	huò	chāoguò
polygon	is	a	having	three	or	exceeding

head noun

sāntiáo	biān	de	fēngbì	túxíng
three	sides		closed	figure

Polygons are closed shapes with three or more straight sides

'a polygon is a with-3-or-more-than-three-sides closed figure': English *polygons are closed shapes with three or more straight sides*. (This illustrates both principles: *duōbiānxíng* is perfectly clear in Chinese: it means many-sided-shape, whereas in English, *polygon* is totally obscure. But the English allows the modifiers to be distributed with greater variety around the noun they modify.)

In scientific Chinese, structures of this kind can become very extended, and they may occur simply as sequences of words without any indication of the semantic relationship to each other or to the head noun. Here is a slightly simplified example from an article in computer science. The English might be

What this paper will discuss is the content of the parametric analysis of the composition and structure of Chinese characters

The Chinese has the words as follows:

character	component	structure	parameter	analysis	content
漢 字	部件	結構	參數	分析	的內容
hànzì	bùjiàn	jiégòu	cānshù	fēnxī	de nèiróng

all strung out as modifiers to the word nèiróng 'content'.

Text 6.6

本文要討論的是漢字部 件結構參數分析的內容, 方法和原則。

Běnwén	yào	taǒlùn	de	shì	hàn zì
What this paper	will	discuss		is	Chinese character 'of'

Head noun

bùjiàn	jiégòu	cānshù	fēnxì	de	nèiróng
component	structure	parameter	analysis		content

'and' 'of' 'of'

(The Head is actually a nominal group 'content, method and principle')

It would be possible to insert structure markers, either 'of' 的 *de* or 'and' 和 *hé*, in between any of these pairs of words; but not to transfer any of them to **follow** the head word, whereas in English, it is possible to vary the sequence of the elements in a number of ways. If we leave out the word 'content', to simplify the illustration, we could construct the four variants shown below:

(i) *parametric analysis of the composition and structure of Chinese characters;*
(ii) *parametric analysis of Chinese character composition and structure;*
(iii) *analysis of the componential and structural parameters of Chinese characters;*
(iv) *Chinese character component and structure parameter analysis.*

Even where the modifying element is a clause (a defining relative clause), it always precedes the Head; if I may show one further example, taken from the same article:

Text 6.7

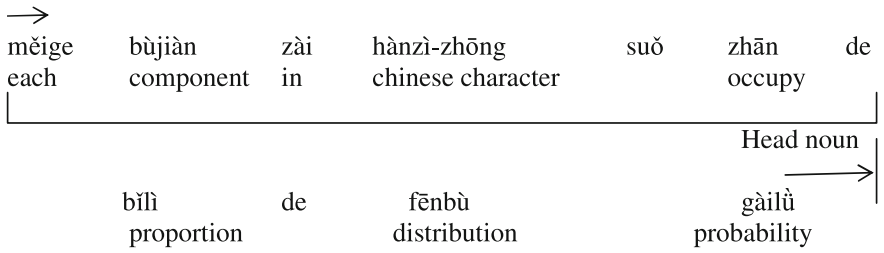
Chinese	我們	要進一步	統計	每個	部件	
Pinyin	wǒmén	yào jìnyíbù	tǒngjì	měigè	bùjiàn	
English gloss	we	further	count	each	component	
Chinese	在	漢 字	的不同部位	的分布	概率	
Pinyin	zài	hànzì	de bùtóng bùwèi	de fēnbù	gàilǜ	
English gloss	in	Chinese character	different position	distribution	probability	
Chinese	的話,	可以	利用	部件		
Pinyin	dehuà,	kéyǐ	lìyòng	bùjiàn		
English gloss		could	use	component		
Chinese	和	結構	的	兩個	參數	信息
Pinyin	hé	jiégòu	de	liǎnggè	cānshù	xìnxī
English gloss	and	structure		two	parameter	information
Chinese	的	綜合	求得,	但如果要	統計	
Pinyin	de	zōnghé	qiúdé,	dàn rúguǒ yào	tǒngjì	
English gloss		synthesis	get	but if	count	
Chinese	每個	部件	在	漢字中		
Pinyin	měigè	bùjiàn	zài	hànzì zhōng		
English gloss	each	component	in	Chinese character		

(continued)

Chinese	所佔的	比例	的分布	概率	的話,	
Pinyin	suǒ zhàn de	bǐlì	de fēnbù	gàilǜ	dehuà,	
English gloss	occupy	proportion	distribution	probability		
Chinese	就要	另外	增加	部件	比例	的參數。
Pinyin	jiù yào	lìngwài	zēngjiā	bùjiàn	bǐlì	de cānshù.
English gloss	need	extra	increase	component	proportion	parameter

Translation:

For example: If we are to further count the distributional probability in different positions of Chinese characters for each component, we could use the synthetic information of the two parameters—component and structure, to get the result. But if we are to count the distributional probability of occupational proportion in Chinese characters for each component, we need to add the parameter of componential proportion.



The proportional distribution probability that each component occupies in Chinese characters.

Here, the Head word is *gàilǜ* 'probability'; it is modified by a noun *fēnbù* 'distribution(al)'; a noun marked as modifier by 的, i.e. *bǐlìde* 'proportional'; and a relative clause *měige bùjiàn zài hànzì-zhōng suǒ zhān de* 'which each component occupies among Chinese characters'; all preceding the Head. In English, the Head noun appears somewhere in the middle, and again, there are various alternative arrangements, for example (using a possessive):

each component's proportional probability of distribution among Chinese characters

It is probably safe to say that this is the single feature of learned Chinese that is most difficult for the learner to process, partly because these structures can get extremely long—I once noted one with eight separate modifying elements before the head noun, and partly because their relationship to the head noun, and to each other, is typically not made explicit. It is considerably less explicit even than in English, where at least the postmodifying elements are given a clear semantic status, though the premodifying ones are not. So, as I remarked in discussing scientific English, what educators have to bear in mind is that modern technical discourse, as presented in writing, is very much an expert language, and this is a

still true even if the **terms** are clear, as they usually are in Chinese. The learner has to gain access to it, to be able to construe the implicit structures and semantic relationships.

So for the learner the Chinese presents a clearer picture of the technical terminology, both the individual terms and their mutual relationships being more easily accessible than in English; but a less transparent picture of the structure of complex nominals, where it is more difficult than it is in English to follow the relationships among the various modifying elements.

What the scientific registers of both languages have in common is the feature we found so prominent when tracing the evolution of scientific English: namely grammatical metaphor. This is the process by which some aspect of our experience, instead of being expressed in the form that is most typical in the grammar of the language in question, is expressed in a different way, using a grammatical feature typically used for something else. One of the most common forms of grammatical metaphor, both in English and in Chinese, is using a noun to refer to an action or an event, things that are more typically represented by verbs. So in English, we use nouns like *repulsion*:

The mutual repulsion of the particles

to refer to the action of repelling: the particles repel each other. Similarly: *the conversion of hydrogen to helium* 'hydrogen is converted into helium'. This device enables the writer to distribute the information in the clause in a way that is appropriate to its function in the total discourse, so that it fits into the structure of the argument. And as we saw, in modern academic writing, and in various other registers as well, in general, it can be carried to very considerable lengths, for example:

the truest confirmation of the accuracy of our knowledge is the effectiveness of our actions
'because we can act effectively we are able to confirm that we know about things accurately'

Expressing a process as a noun, or as part of a larger nominal expression, is merely one form of grammatical metaphor—there are many others; but it is perhaps the most important one in this particular context, and it is as widespread in modern Chinese as it is in English. The expressions below are all based on this principle.

我們的	回答	是	否定的
wǒmén de	húidá	shì	fǒudìng de.
our	answer	is	negative
'our answer is in the negative' with **huídá** 'answer' as a noun			

感知	都被	昇華爲	思維
gǎn zhī	dōu bèi	shēnghuá wéi	sīwéi
sense	all	elaborate into	thoughts
'sense perceptions are elaborated into thoughts'			

詞類 型態	分析	有	很大的	局限性
cílèi xíngtài	fēnxī	yǒu	hěn dà de	júxiànxìng
word morphology	analysis	has	very great	limitation
‘the analysis of word morphology has very great limitations’				

掌握		天氣	系統	的改變	和	移動
Zhǎngwò		tiānqì	xìtǒng	de gǎibiàn	Hé	yídòng
grasp		weather	system	change	And	move
規律	就能	分析出		未來的	天氣	變化
guīlǜ	jiù néng	fēnxīchū		wèiláide	Tiānqì	biànhuà
pattern		predict		future	Weather	change
‘Grasping the pattern of change and movement of the weather system will enable the prediction of future weather change’						

When you see expressions such as 由於 *yóu yú* ‘arises from,’, or *fǎnyìng* 反映 ‘reflects’, or *shǔyú* 屬 于 ‘belongs to’, you are likely to have a grammatical metaphor on one or on both sides of it.

We were able to trace the evolution of these patterns of discourse in English over the five or six centuries from Chaucer to the present day, and we found there a continuous process, although one that has accelerated in the present century. The development in Chinese appears more sudden; the learned language of scientific, philosophical, historical and other such texts until less than a hundred years ago, which were all written in wényán, inevitably looks very remote from the language of today. This language has to be analysed in much greater detail before we can know how far it was already anticipating the development of the modern forms of the language in which Chinese science and other fields of learning are expressed today. But there have obviously been very rapid changes in the forms of written Chinese, corresponding to the tremendous growth of scientific, technical and other scholarly activity that is taking place in the language.

What is most noticeable about the way the Chinese language has developed in these particular registers is that it is very similar, in its direction, to the way that English has developed. This is sometimes explained as another form of borrowing: Chinese, it is said, has borrowed these semantic styles from the European languages: from English, Russian and German. It would be foolish to deny the influence of these other languages; many Chinese scholars read material in these languages in the original, and many more again read them in the form of translations which still carry much of the flavor of the original. But I do not think that is the major factor. It is not, I think, the influence of other languages, so much as the demands that are made on the language when it is used for scientific and other learned purposes, and these demands are the same, whatever language you are writing in. Of course, there will be differences, arising out of the grammatical patterns and semantic styles that are particular to each language, and I have been focusing on some of these, those that seem to me to constitute significant

differences between Chinese and English. But as both languages continue to develop, under pressure from the development of technology and the social changes that go with it, then inevitably they will develop in the same direction.

A very clear instance of this is the language of computer science, from which I have taken some of my illustrations. The forms of Chinese and the forms of English used in artificial intelligence—in expert systems, text generation and so on—will inevitably come to look more and more alike. It would be quite wrong, in my view, to think of this as 'Chinese getting to look more like English'; the fact is that both Chinese and English are changing in response to new demands that are being made on them, as every language does, and where the demands are the same, then the languages will take similar measures to enable them to meet them. And while a language may grow special registers for the purpose, these are never insulated, never totally cut off, at least in an educated population, from the ordinary daily contexts of language use.

I have tried to focus, in this lecture as throughout, on the issue of language education, looking at features of language as they appear from the point of view of the learner—of children, pupils, students, having to master these languages as a means of interpreting their early experience of the world and as their lifeline through the years of school. Here, I have tried to select a few illustrations that would bring out something of the nature of the Chinese language, again in relation to this general perspective of language and learning. I hope to have conveyed something of the great interest of the grammar of Chinese; I hope also that in bringing Chinese and English together in this way, I have been able to suggest some of the ways in which, by looking into the forms and meanings of one language, we can at the same time gain further insight into the forms and the meanings of another.

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Chapter 7
Languages and Cultures

My general theme has been that of language and learning; and inevitably in considering the various specific aspects of this theme, my approach has been to interpret language in its cultural context. But I have not previously raised the question of the relationship of language to culture in a general or systematic way; certain things I have simply taken for granted, and others I have referred to in passing as they arose in the context of some particular step in the discussion. So in planning these talks, I felt the need to try and develop an overall perspective on language and culture within which issues of language education can be situated.

Perhaps, the single most obvious fact about languages is that we do not all speak the same one. If we take the world as a whole, there were at one time probably some seven or eight thousand different languages, all recognizably distinct; and even today, there are still at least half that number. (You cannot count them very accurately since there will always be disputes about whether to count related tongues as languages or as dialects.) Since it was also obvious that these different human groups, speaking different languages, also displayed differences of culture, it was a natural question to raise, what was the relation between the two? Did the differences, linguistic and cultural, in some sense match up with each other? and if so, which caused which—do people speak differently because they think and behave differently, or is it the other way round?

It was **natural** to pose the question this way, but it was also rather unfortunate for three reasons. First, to put it like this nails the question down to differences **between languages**, whereas we need to be able to focus attention more broadly, on the relation between culture and language **in general**—on features of human language as such, on what are the properties common to all languages which enable language to continue and to transmit culture; and also, sometimes, to focus more narrowly, on differences within one language—among its dialects and registers. Secondly, posing it this way sets up the question as a chicken-and-egg debate, a simple logical trap, since if one thing causes another it must exist first, whereas it is obvious that we cannot conceive of a culture without language or of a language without culture. And thirdly, it suggests—or at least it led some to assume, although strictly it need not have done—that one could relate the two piecemeal, that there would be little bits of language corresponding to little bits of

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culture, whereas a language and a culture are both highly complex constructs and any part has to be seen in relation to the whole—moreover, the whole, in turn, is not a smoothly running machine in which every component has and knows its place, but a dynamic open system (to use the mathematical name for such things) full of pressures and tensions, which continues to exist precisely and only because it is always changing.

In one sense, of course, there are little bits of language that correspond to little bits of culture: there are words, and they refer to things. So if a culture does not have any experience, directly or by report, of a particular object it will have no name for it; the ancient Romans had no word for traffic lights, or for chopsticks. It used to be thought that the more important an object was in a culture, the more different root words for it there would be: there are a lot of different words for camels in Arabic, for example, because (it was said) camels occupy an important place in Arab economy. But this is rather naive: creating new words is not the only way of expanding your resources for meaning—you can also do it with the aid of the grammar. Presumably rice holds an important place for the Chinese; but, apart from distinguishing between rice in the fields (*dào*), rice in the shops (*mǐ*) and rice on the table (*fàn*), Chinese makes all the relevant distinctions by compounding, making structures of the taxonomic kind discussed in the previous lecture; so *mǐ* is either *dàmǐ*, 'rice', or *xiǎomǐ*, 'míllet', or *nuòmǐ*, 'sticky rice', or *yùmǐ*, 'maize', or *gaōliángmǐ*, 'sorghum', or … There is no need for a vast stock of different root words (morphemes); you can take a small number and then combine them in various ways.

And this leads to the more significant question of whether the grammar has anything to do with the culture. The great American linguist Edward Sapir observed that, as he put it, 'there is such a thing as a basic plan, a certain cut, to each language'; and since, to use another of Sapir's metaphors, language imposes a 'grid' on experience—see the discussion in the first lecture—it might well be that different languages impose **different** grids, and so lead their speakers to interpret experience in different ways (Sapir 1921). Sapir thought this was possible, and so did his pupil and colleague Benjamin Lee Whorf; but although it is over half a century since Sapir and Whorf made these observations, the matter is still in dispute (Whorf 1945). Some linguists deny absolutely that there is any relationship at all; they insist that just as different languages have different **sound** systems, and there is no cultural significance in that kind of variation (which is certainly true), so, they say, different languages have different grammars, and there is no cultural significance in that either—it is purely random variation; and they point out that languages from the same culture area can have vastly different kinds of grammatical structure (which again is true). Others say, however, that these linguists are talking about rather superficial, formal features of the grammar; and if you dig deeper, to the more functional, more semantic aspects of grammar you do find culturally significant variation. This was Whorf's view. He emphasized (and he was right) that it was necessary to explore the more hidden parts of the grammar of a language, those that were revealed only by a very penetrating linguistic analysis (he called these 'cryptotypes'); if you did that you would find the real 'cut' of the language (to use Sapir's term), and then you might hope to find significant links with the culture.

Whorf gave some very convincing examples, which those who do not want to believe him (mainly psychologists) have been trying unsuccessfully to disprove ever since. But Whorf's examples are taken from languages that are culturally very far apart: English, and other European languages on the one hand, and North American Indian languages on the other: languages that were not written down, and whose speakers' culture was based on a very different kind of economy. We might expect the very great cultural distance between agricultural societies, with their long tradition of written language, and hunting-gathering societies, like those of Australian Aborigines, or the indigenous peoples of Malaya and Borneo, to be reflected in the grammar of the languages they speak, but this does not indicate that we shall find significant differences between English and Chinese, because on this scale, Europe and China come to look very much alike. They both had a long period of settled agriculture and a feudal-type social structure to go with it; they may have had different systems of beliefs and values, different types of family relationships and so on, but their basic view of reality—which is what grammar is about (at least the part of the grammar that Whorf studied)—was very much the same. We can ask, for example whether the difference between English tense and Chinese aspect means that Chinese and English speakers have a different view of time, not in the superficial sense of arriving punctually to keep an appointment (Chinese would win easily in any competition for punctuality!) but in the deeper sense of notions about events and the relations between events—relations of causality and so on. This is interesting ground to explore, and some scholars do explore it (e.g. the Japanese linguist Ikegami in relation to the grammar of Japanese) (Ikegami 1984). But it is extremely difficult and demands very penetrating study of one of the most problematic areas in the whole of grammar, and I shall certainly not try to solve it here.

Because of the difficulty of resolving these questions, linguists tended to put them aside, and for a generation or so no one really worked on them. The modern approach is to try to relate language to other systems in the culture; to put this another way, we can regard a culture as something that is made up of a lot of **languages**, or rather—since they are not languages in the strict sense—of systems of meanings, or **semiotic** systems. So a religion, for example, or a kinship system, the way families and family relationships are organized, or even the conventions of the clothes people wear—what is regarded as formal or informal, decent or indecent and so on—all these can be thought of as semiotic systems. Some of these systems use the resources of language as their own means of expression: for example a religious system is partly expressed through (non-verbal) ritual and partly through language. This means that we can look at language in its interaction with other forms of behaviour. A very interesting example of a study of this kind is Ruqaiya Hasan's work on Urdu, in her paper 'Ways of saying: ways of meaning' which appeared in the book *Semiotics of Culture and Language*, a book which is an excellent example of this kind of approach (Hasan 1984). Hasan shows that in the grammar of Urdu there are a large number of what she calls 'implicit devices': that is to say, grammatical structures in which it is not required to refer explicitly to who

or what is involved in a particular process. Whereas in English there are only very restricted contexts in which you can leave out reference to participants (mainly what is called 'Subject ellipsis' where the Subject has been mentioned before), in Urdu this can happen more or less anywhere where the context of situation makes it clear who or what you are referring to. An example is Text 7.1:

Text 7.1: Ruqaiya Hasan: 'Ways of saying and ways of meaning'

(a)

əre bhəi kəhā cəli gaī? mere kəpRe tək nəhī nykale.
hello where walked went? my clothes not taken-out.
hello, where have (–) got to? (–) not even taken out my clothes.

nəhame ko bəyTha hū. der ho jae gi.
bathe to sitting am. late become go will.
(I) am sitting waiting to have my bath. (–) will get late.

(b)

–	pəka lia? cooked?	(i.e. have you finished cooking it?)
–	hā yes.	(yes)
–	cəkhao zəra give a taste	(let me have a little taste)
–	lijie have	(here you are)
–	bəhwt məze ka həy; tez āc pər əb nə rəkkho; very taste of is high flame on now no keep is very tasty; don't put on high flame now.	

As she puts it, 'The system of the Urdu language itself … allows a higher degree of implicitness to its speakers than that which is permitted by the system of the English language'. Now this could be just an arbitrary fact of the grammar. But, Ruqaiya Hasan argues, it is also true that the speakers of the language take up the implicit option in a very wide range of different contexts. To be an Urdu speaker, she says 'is to believe that your addressee knows what you are on about; it is to assume that the chances of ambiguity are so low as to be almost negligible'. In other words, the addressee 'must be able to retrieve the information which the speaker refers to only implicitly'; and this 'is made possible by participation in the same culture', in which a great deal is taken for granted, about the social relationships between people and the highly determinate roles that they take on as a consequence of these relationships. The argument is the grammar provides the possibility of implicit reference; the forms of the culture make this appropriate in many contexts, so it is widely taken up in speech; and this in turn reinforces this feature of the grammar. We cannot prove or disprove this; but it is entirely in keeping with our current understanding of how languages evolve (exactly parallel, in fact, to the processes of the development of nominalization and grammatical metaphor that we saw taking place in scientific English).

Hasan is not suggesting of course that Urdu is the only language which displays this kind of implicitness, but rather that this kind of 'meaning style' may (to the extent that the grammatical structure can accommodate it) be characteristic of cultures where the members are close-knit and homogeneous, sharing many of the same assumptions and values. In a sense, it is an extension of family language, which is typically also highly implicit in this way; as Hasan points out, this kind of discourse also occurs among speakers of English—the difference being that standard English as it has evolved in recent centuries favours the explicit style of meaning that is appropriate to interaction in contexts where people do not all share the same experiences and much **less** of what a person says can be taken for granted.

In other words, in those cultures, and in those cultural contexts, where experiences and beliefs and attitudes are largely shared among those taking part, the discourse will favour **implicit** meaning styles; and this in turn will select for implicit structures in the grammar of the language concerned. On the other hand, in those cultures, and cultural contexts, where people are constantly meeting with strangers, and with people from other social backgrounds than their own, so that they cannot expect shared knowledge and common assumptions, the discourse will favour **explicit** styles of meaning; and this in turn will bring to the foreground the corresponding explicit forms of expression in the grammar (cf. on Tagalog, Martin 1988).

Now it is well known that in language contact situations, where two or more languages are used in a common cultural environment, the languages grow to look alike, even if they are in the first instance quite unrelated. Three examples of this familiar to linguists are Hindi, Kannada and Marathi in southwest India, on the borders of Mysore and Maharashtra; Swahili, Luo and the Nilotic languages in Kenya; and Bulgarian, Greek and Turkish in the Balkans, southeast Europe. This tendency is known as 'areal convergence', 'areal affinity'.

Now, by a related process, a language that is taken over into new cultural contexts also tends to get changed along the way, as it adapts to the meaning styles of its new speakers. In the first case, the semantic patterns gradually assimilate to one another; in the second, they are more or less suddenly transferred from the original language (or language group) into the newcomer. So, as English travelled around the world, as Portuguese and Dutch had done before it, it became adapted to other languages in the usual way: first in the form of pidgins, special registers for trade and other restricted purposes, and then in various creoles, which are not partial languages (as pidgins are) but full languages, learnt by the children of the community as their mother tongue, that happen to have this kind of mixed origin. There is an excellent summary of all this in an article by Jeffrey Ellis, called 'Some speculations on language contact in a wider setting' (in the book *Semiotics of Culture and Language*) (Ellis 1984). Ellis gives examples from English-based creoles in which he shows how in these contact situations the 'linguistic resources of English are rearranged' to suit the semantic needs of the

indigenous languages—a process that as he says can take place in any of the functional components of the grammar. Here is a well-known example:

Text 7.2

English: you, I/me, we/us
Tokpisin (Neo-Melanesian):

yu	you	'you (singular)'
yupela	you fellows	'you (plural)'
yutupela	you two fellows	'you (dual)'
yutripela	you three fellows	'you (trial)'
yumi	you (and) me	'we (inclusive)'
mi	me	'I'
mipela	me fellows	'we (exclusive plural)'
mitupela	me two fellows	'we (exclusive dual)'
mitripela	me three fellows	'we (exclusive trial)'

To give a different example, there are instances where English has taken on a system of aspect; this is attested for in the English spoken in Trinidad, in the West Indies. So the natural tendency that all languages have, to be constantly changing, means that they can be readily adapted to meet new circumstances. New speakers of a language can modify its grammar so that it takes on the meaning styles, the semantic colouring, of the other languages into whose territory it is being imported.

Now a creole is a wholly new language; the English-based creoles that have become community languages, and in some cases national languages like Neo-Melanesian, in Papua New Guinea, can no longer be thought of as varieties of English: they are new languages that have arisen out of a mixture of English with something else. There has often been some prejudice against them; but this is an entirely respectable ancestry for a language to have, and in any case it is only a more extreme example of a process that is going on everywhere all the time. Creolization—changes in one language that result from contact with another—is a regular feature of linguistic history: many of the changes that English has undergone throughout the last 1500 years have arisen in this way, through contact with Celtic, Norse and Danish, Norman French and other outside sources. And this is the process that is going on in English around the world today, in all the many varieties of what Braj Kachru calls non-native Englishes, the institutionalized second language forms of English found in East and West Africa, South and Southeast Asia, etc.—and which in Kachru's estimate are spoken by about the same number of people as use the native varieties of English—around 350 million in each case.

In his book *The Alchemy of English: The spread, functions and models of non-native Englishes,* Kachru writes:

> The institutionalized second language varieties [of English] have a long history of acculturation in new cultural and geographical contexts: they have a large range of functions in the local educational, administrative and legal systems. The result of such uses is that such varieties have developed nativized discourse and style types and functionally determined sublanguages (registers), and are used as a linguistic vehicle for creative writing in various sub-genres.

Kachru discusses in detail the example of English in South Asia, the Indian subcontinent, and identifies some of its distinctive characteristics (Kachru 1986). These include features of pronunciation, such as retroflex consonants, prothetic vowels before initial clusters [Iṣṭeʃan] (station), and syllable-timed rhythm; features of vocabulary, both the use of words from Indian languages and the use of new collocations of English words, such as *cousin-sister*, *brother-anointing ceremony*, *bull work*; grammatical features, such as reduplication (*to go crying crying*), variant forms of interrogatives, and different tense forms, e.g. *Ram was knowing that he would come*, and also distinctive rhetorical and functional styles. Kachru gives examples from various sources, including literary texts, noting that poetry was written in English in India as early as 1830 and that 'the first fiction in English by an Indian writer was published by Sochee Chunder Dutt in 1845'. Text 7.3 gives a few examples:

Text 7.3 (from Braj Kachru: The Alchemy of English)

(a)

Wanted well-settled bridegroom for a Kerala fair, graduate Baradwaja gotram, Astasastram girl … Subsect no bar. Send horoscope and details. [*Hindu*, 1 July 1979]
Non-Koundanya well qualified prospective bridegroom below 20 for graduate Iyengar girl, daughter of engineer. Mirugaserusham. No. dosham. Average complexion. Reply with horoscope. [*Hindu*, 1 July 1979]

(b)

"Come in," said Badan, and jumped out of the verandah towards the door. "Come in, Acharya Mahasaya; this is an auspicious day when the door of my house has been blessed with the dust of your honour's feet. Gayaram, fetch an *asan* (a small carpet) for the Acharya Mahasaya to sit on." [Day, 1913:48; quoted by Sarma, 1978:330]

(c)

Dilchain had, in the meantime, discovered a small earthen doll buried under the oven when she was cleaning it one day. She went and showed it to Begam Kalim and Begam Habib.

"It is the effect of witchcraft," she said, "which is responsible for Mian's illness."

The tender hearts of the women were filled with dread. They sent Dilchain to Aakhoonji Saheb, who wrote verses from the Koran on seven snow-white places in saffron water. The plates were to be washed with a little water, and the water from one plate was to be taken for three days, a drop in the morning …

But strange things happened inside the zenana. A pot full of ill-omened things came flying in the air and struck against the bare trunk of the date palm whose leaves had all fallen. Another day some cooled cereal was found lying under the henna tree …

Poor women from the neighbourhood came, fluttering their burqas and dragging their slippers under them, and sympathized …

Thus they came and sympathized and suggested cures and medicines. One said to Begam Habib:

"You must go to the tomb of Hazrat Mahboob Elahi and pray …"

"You must give him water from the well at Hazrat Nizamuddin's tomb," another suggested. "It has magical qualities and has worked miracles …" [Ali, 1966:278-79]

Thus, English has become adapted to take on a variety of roles in all the South Asian countries. In the process, it has developed different registers, and also different regional and social varieties (North India, South India, Sri Lanka …; Hindu

and Moslem, and so on);—it is not just one uniform kind of English, but a whole spectrum of Englishes, all of them, however, having a distinctive South Asian flavour.

Notice that we have been able to identify two different components in the changes that have taken place; or rather, not so much two components as two sources, two different routes by which these changes have come about. Some are modifications based on the languages of the region—for example syllable-based rhythm, which just happens to be a feature of Indian languages, while others are adaptations to the **culture**, for example, the rhetorical styles of matrimonial advertisements, or the sayings and actions described in the two passages of fiction.

Even the second of these processes can still be thought of as **linguistic** adaptation, since comparable styles and expressions in fact occur in the indigenous languages. A case where there is no linguistic model is the sort of historical process that took place, and still is taking place, that gave rise to the various native Englishes. When English speakers settled in America, Canada, South Africa, Australia and New Zealand, they took their language with them; this meant that for their descendants, English was first language not second, so there was no **linguistic** adaptation to be made on their part. But there was adaptation to a new environment. However, much the colonists might start, as indeed they had to, by maintaining the traditional forms of their English culture, the environment that they had moved into was in fact very different: there was different weather, different animals and plants, different health hazards, and all these, and the different life style that evolved in response to them, also led to modifications in the language. So that even before the linguistic changes that are inevitably brought about when non-English-speaking immigrants begin to arrive, these distinctive varieties of English, such as American English and Australian English, have already clearly emerged: both different sound systems, which are the natural product of dispersal, and also different words, different expressions, and the first signs of different styles of meaning (cf. Kachru 1982).

So the Englishes tend to grow apart, as a result of all the natural processes that take place in every language: some more or less random, but others produced by the environment—by contact with other languages and cultures, or changes in the material conditions of life. Now if all this had happened far in the past, as likely as not these varieties would have finished up as quite different languages—as Latin did, for example, as it spread across Southern Europe. But today matters are very different, and there are equally powerful tendencies working the other way.

First, although in its local, national and regional functions English might tend to split apart, it also has an important function as a global, **international** language; and in this function it has, obviously, to hold together. There would be a certain contradiction in an international language that was not international. This does not mean of course that it has to be uniform—exactly the same whenever it is used, but it does mean that at least those members of a population who use English in international contexts must preserve its intelligibility. And this is one powerful factor that holds all the Englishes together. In that respect its archaic spelling system is a blessing in disguise—a rather heavy disguise, I admit!—because it accommodates considerable variation in pronunciation while still maintaining enough indication of the sound

patterns of the language to serve as an anchorage (presumably all those who want international English have to be literate).

But there is another factor that comes into the balance, and that is that culture is increasingly becoming world culture. Even very conservative cultures are changing, and there are few places where the young people do not feel themselves to be citizens of the world, whether because they all listen to the same music and eat the same fast food, or because they have a computer at home and use the same programmes. (Of course I am aware of millions in every continent who do not share in these material possessions. But it would be quite wrong to think that therefore they do not know about these things. In general, they do; and it is their shared knowledge that constitutes the world culture.) This not only holds English together; it tends to bring all high-technology languages closer together, as they struggle to keep up with the flood of information to be encoded. It may be that fewer languages remain in the race; but those that do have to develop very much the same kind of muscular power.

By the same process as that by which new contexts are brought into a language, so also the old contexts disappear. In illustrating this point, I am struck by a strange misconception that seems to run through many discussions of English, which is this. The English of England, where it all started, is often not mentioned at all; the assumption being made (and sometimes explicitly stated) that while English everywhere else has changed, British English has remained where it was. Nothing would be more untrue. British English has changed as much as English anywhere else over a comparable period of time—and in some ways perhaps even more so. And I think that this is a good place to let you hear some real English, as it was spoken not very long ago, certainly within my lifetime. I had an uncle, who made cheeses in a village in Wensleydale—the best cheeses in the world. It was not **my** dialect that he spoke, my uncle; I come from a big city, where the dialect had long been replaced by a local variety of the standard (though even that could be fairly outlandish to strangers); but I could understand the country speech. They write quite reasonable poetry in this dialect; so here is part of a poem in the language of that region.

Text 7.4 (a)

Redundancy

Nobbut t'fireless arth an t'geeable and
Mark t'spot weear t'Carter family could mend
An mek onny ilk o' cart,
Wi' spooaks riven fra' yak, naffs of awm,
Fellies of esh, grown i' different parts
O'Swaadil.

Beams sawn in t'pit an' fashioned wi't'adze,
Wur med wi' sike care
Thu'd last un weear
A 'undred yeears, aye mair.

****

T'corner cupboard, t'rocking chair,
T'fower posster bed, t'kitchen press,
T'auld bellesis, t'creddle,
T'blanket kist an t'fiddle,
Proud possessions o monny a farm
Nivver cam ter onny arm,
An are wuth mooer cash
Ner all t'modern trash.

****

Soa, t'shavins, t'chisel, t'plane and t'hammer,
Aye, Nazareth's workshop is redundant
In t'scyentific age, abundant
I' larnin, brass an t'clamour
O' machines.
Only t'ruins and t'antiques remain
Of an age ut wur, mebbe, sane.

JANE H. SMITH (North Riding)

This is rural dialect; here for contrast is a poem in an urban dialect from a different part of Yorkshire—from the town where my father grew up, as it happens:

Text 7.4 (b)

Betty Barton's cat

Betty Barton's owd grey cat were a constant source of grief,
Is shinin sides were sleek an fat, for e wer sich a thief.
If Shoo clapped owt dahn in t eatin line, shoo couldn't turn er back,
But what towd cat ad collred it, an opped it in a crack.
Shoo leathered it wit dishclart, an brayed it wi a knop stick,
An once shoo brok a winder wi chuckin alf a brick.

Shoo bowt some sausages one day, to fry for their Sam's dinner,
Shoo put em down ont table, an as sure as I'm a sinner,
Shoo'd nobbut gone to t back o t door an wer engine up er shawl,
When summat grey whizzed passed er, an loaped ower t gardin wall.
Shoo flew to t door-oil just I time to git an odd brief squint
O't cat, wi a sausage in it's marth, an t rest trailin on behint.

Poor Bet were soa disgusted, sh cem in an slammim t door
Shoo looked at 'empty sausage plate, an set er down to roar.
An when their Sam cem in that neet, instead o t usual kiss,
Shoo wer lookin fahl an glumpy like, e said "Nah Bet, ah's this?"
So shoo telled im thread to t needle, an e listened stern an still
As shoo flashed aht at finnish, "If t cat doan't goa, Ah will."

Nah Sam wer fond o towd grey cat, but e were fonder still o Bet,
So e said as e sat down to eat, "Ne'er eed old lass, don't fret,
Ah tell thee what, I'll mak a poak, an drahn towd cat in t river
Int morning on mi way to wark, then that'll be shut of im for ivver.

Next morning Sam picked up towd cat, it looked so meek an tame,
'e stroked its ead an softly said "Nay lad it seems a shame."
But e shut is teeth together, opened poak an shoved im in,
An fastened top securely wi a rusty safety pin.
'e med is way to t watter, an when e got t't brink,
'e flung it into t middle an stopped to watch it sink.

But it didn't sink, an as e watched is een grew fascinated,
Nivver in is life afore ad e seen a poak so animated.
It kicked an yowled an struggled as it floated in still further,
Poor Sam, e blocked is ears an fled thru t spot as if e'd done a murther.

When e got ome that neet, e began to tell is story,
Saying "Tha needn't bother thisen no more, towd cat as gone to glory."
"Hes it?", said Bet, "then sithee theer", an in calm an sweet repose
Was cat, laid on t hearthston, wi its paws curled rahnd it nose!

Poor Sam, e stared an stared again, says e "Aint that a degger.
Howivver as e getten out? I'll swear I drahnded t begger."
Said Bet, "Nah sit thee dahn an get thi tea, an remember puss has nine lives."

"Aye", said Sam, "Learn this of me. Fahl words I'll nivver use em.
But I'll noan mella tuther eight if t cat lives as long as Methusalum."

Recited by Mrs. Kitson
Sent to us by her niece Mrs. Fearnley, Pudsey
(West Riding)

Texts 7.4 (a) and (b) are taken from Summer Bulletin, Yorkshire Dialect Society (1986, 1991). That is how English was. But that was just one of dozens of such dialects spoken around the country; all very different, sometimes so far apart as to be quite incomprehensible to each other—and of course incomprehensible to anyone who spoke only standard English. Most of these dialects have disappeared, or are spoken now only by very old people—when the English Dialect Survey was carried out in the years 1950–1970, the researchers used as their subjects for recording the dialects only people who were over 70 years of age. (If you look up the volumes published by that survey you will see that one of the editors is called Halliday. He was my father, who was himself also a dialect scholar and poet.)

Why have these dialects disappeared?—because they are no longer functional. There are no longer the distinct rural communities with their distinctive local cultures, with people growing up and living their lives all in the one place. There was no place for this kind of linguistic variation in the modern world. These dialects, all spoken within 300 miles of London, were as different from standard British English as are any of the local Englishes now spoken around the world. It would be hard to find as rapid a change in English anywhere as the change that has taken place in British speech in my lifetime.

If we leave out of account these original rural dialects, and consider just the language of the cities, then the English of London has changed to the same extent as that of New York or Toronto or Sydney: English in Britain is, naturally, as prone to adapt to changing circumstances as is English anywhere else. And interestingly, it

has been observed that exported varieties of a language tend in some respects to be more conservative than the variety that stayed at home; thus, there are a number of more archaic features preserved in American speech that have disappeared from the speech of Britain—some features of pronunciation for example, and the subjunctive in the grammar. So it is wrong to think of the other forms of English changing and British English retaining its earlier state—as, in fact, a glance at contemporary British fiction and drama will show.

If, then, all languages change in this way, and if dialects disappear, like those of England, because they are no longer functional, we might well ask why does not everyone now speak alike? There is still a great deal of variation in the way that Londoners speak, for example. The answer has to be: because, although particular instances of dialect will disappear (like the rural dialects when there are no longer the distinct rural communities), as a whole variation of this kind is highly functional. The person who established that point was the American linguist William Labov, whose research in the 1960s in New York and other American cities, showed that dialect variation of the kind that is found in modern urban communities, where the dialects are not regional ones, but are social dialects, determined by social class, has a very clear function: it functions to express the way society is structured, and thus to enable those who are growing up in that society to learn how it is structured. What Labov showed, in a series of very elegant studies, was that New Yorkers—those above the age of 18—were extremely sensitive to minute variations in the speech of other New Yorkers; teenagers were in process of becoming sensitized, whereas outsiders were not sensitive to them at all. He showed furthermore how New Yorkers used this linguistic information to construct their mental picture of the world they lived in. In a complex class-based society, it is patterns of dialect variation that keep the social structure in being.

For the individual living in such societies, the dialect provides the badge of membership. But it is not a dialect in the old regional sense of the term. These are rather fluid societies: a person living in a big industrial city is not locked into the rigidity of a feudal agricultural system, but has room to move, at least within certain limits. The dialect structures of cities like New York and London allow a person to identify himself with a group—but also to change his identity if he wishes. And by the same token they provide an area for social action: you can choose a markedly working class form of speech if you want to present yourself as a militant; or you can foreground an ethnic identity by maintaining the appropriate kind of accent. In all these ways, **social dialects** are functional, and hence show no tendency to disappear; in fact Labov's findings suggested that New York speech was getting **more** stratified rather than less.

But the contexts of city life are varied and shifting; city people are involved daily in transactions and encounters of widely varying kinds. So even the same person within the same day tends to have more than one voice, in the sense that he is constantly moving among different contexts—open or closed, formal or informal, familiar or strange—and adapting his speech as he does so. In this way, he is showing the same kind of style shift as is displayed by members of those traditional communities, for example in parts of Southeast Asia, whose language was

structured into stylistically distinct levels that had to be selected appropriately according to the occasion—for talking to superiors, to inferiors, to equals, or to members of the nobility. City dwellers do not shift on quite that scale; but they are able to mind their p's and q's in the more formal context and to dress up their language as the occasion demands. So the original concept of a dialect has to be modified, in relation to city speech, to take account of this less extreme, but much more complex, kind of variation.

Increasingly, however, in our modern cities, the 'voices' are actually different languages. A city may well be a multilingual speech community. So in Australia, in both Sydney and Melbourne as many as one quarter of the population may use some language other than English in their home and family. In school, they will normally use English, although there are a few bilingual programmes in primary schools in which some subjects are taught in a language other than English. Such children therefore grow up as bilinguals, with English as language of education and another language, that of their original speech community, as the language of the home. The 14 languages other than English that are most widely spoken in Sydney (out of a total of well over a hundred) were at the previous census:

Italian	Greek	Serbo-Croatian	German	Arabic
Spanish	French	Maltese	Polish	Chinese
Dutch	Hungarian	Turkish	Russian	

In Melbourne, the **order** is slightly different, and there have been changes in both cities since these statistics were attained; but the general picture is very much along these lines. (Taken from Michael Clyne's book *Multilingual Australia.*) (Clyne 1982)

Now as would be expected many of the Australian language communities take steps to maintain their languages, particularly in the form of community language schools where the children go to study the language—usually on Saturday mornings, Saturday not being a normal school day. In some of these communities—for example the Italians—the question then arises: which form of the language should the children learn? Most of the Italians in Australia come originally from the south of Italy, particularly Calabria and Sicily, where the people speak dialects that are very different from standard Italian. Should the Italian children growing up in Australia learn the standard language, which comes from the north (Tuscany) and which their families may not know, or should they learn the dialect so they can talk to their grandmothers? There are two views on this. Those who see the language as primarily a link with the past tend to favour the dialect; that, they say, is the way to preserve the memory of one's cultural origins. Those who look more to the future, and want Italian to remain a part of their group identity, as 'Italo-Australians', favour the standard language. For them, Italian is not so much a way of retaining something old as a way of creating something new: a distinct social status within a multicultural society, in which their dialect divisions are no longer relevant and the language serves an integrating rather than a diversifying function. They are Australians, not Italians; but Australians of a specific Italian kind.

Let us look at the question of Singapore English in the light of experience elsewhere. It is natural to expect that there will be a distinctive Singapore variety of English; and indeed, it seems to me there already is. As long as 'being a Singaporean', 'being an Australian' and so on are meaningful concepts, which they will be for as far as we can see into the future, then there are likely to be linguistic features that symbolize and help to create these identities. This phenomenon arises, as we have seen, in two ways, as a result of two processes each of which reinforces the other. In the first place, it arises inevitably because of the cultural and more particularly the linguistic environment in which English is used: and this in turn is a combination of two factors: (1) the background of the speakers—the other languages they know, and their cultural inheritance, with (2) the roles that English plays in Singapore as official and working language, especially its role in education. This particular combination of circumstances is, obviously, unique to Singapore. In the second place, the phenomenon of a Singapore English arises because it makes sense; it is functional, in that it helps to create and maintain the Singaporean identity. As long as there are nations, then nationhood—in the sense of belonging to a particular nation—will be an essential component in a person's make-up; and language is the main symbolic system through which that component is expressed.

But since English is also an international language—and this is one of the reasons for giving it the role it has in Singapore, a country which more than most depends on its international communication networks—Singapore English comes under a strong counter-pressure to ensure that it remains intelligible (and readily intelligible, not something you have to struggle with) to users of English from all around the world. So it is to be expected that Singapore English will have a recognizable accent, some local words and forms of expression, and some of its own distinctive idiom; but the accent will not be so deviant, or the local lexical and grammatical content so high, as to present problems to other anglophones for whom English is either first, equal first, second or foreign language.

Thirdly, what we call 'Singapore English' will not in fact be one homogenous variety. It will be a variable array: encompassing a considerable range of differences in accent—vowel and consonant qualities, rhythm and intonation—and also in grammar and vocabulary. Where any particular speaker will locate himself in this array will depend on a number of factors. Some speakers are likely to range over the whole space, choosing some variants in formal and transnational contexts and others in their more casual encounters. Other speakers may restrict themselves to a much smaller amount of variation; their exact range will probably depend on the part that English plays in their lives—which in turn is a function of their place in the structure of society, especially perhaps in the level and kind of decision-making responsibility that falls to them (and also to their family members) in their occupations.

Fourthly, accompanying this highly complex pattern of variation in performance (typical, as we have seen, of urban speech communities in the English-speaking world), there are likely to be strongly held **attitudes** to language; language will occupy a prominent place in people's thinking, a lot of space in the correspondence columns of the newspapers and in the media, and so on. Some people will insist that

there is one and only one correct form of English and that any departures and deviations from this norm should be firmly proscribed and stamped out wherever they appear. Others will be less hawkish in their attitudes, but most people are likely to feel that some forms of a language are inherently superior to others—that there is some objective criterion for 'good grammar', 'a good accent' and that while they themselves have never achieved this perfect state, and never will, in an ideal world everyone would speak and write in the same idealized way.

Such a highly complex pattern of English in Singapore has in fact been observed and described in a number of important studies, such as Ray Tongue's The English of Singapore and Malaysia (Tongue 1974); John Platt & Heidi Weber's English in Singapore and Malaysia: status, features and functions (Platt and Weber 1980); and informative articles by Mary Tay, Anthea Gupta and others. Students of the Department of English at this University have produced some interesting studies of attitudes to English on the part of teachers, students and secondary pupils. And it seems clear that what is emerging—and what I think is bound to emerge, as a catalyst, as a way of giving recognition to the underlying order that keeps all these conflicting pressures and attitudes in some kind of dynamic equilibrium—is the conception of *Standard Singapore English*: as the term is used, for example, by Tay and Gupta in their article 'Towards a description of Standard Singapore English', written in 1983 (Tay and Gupta 1983). This embodies the twofold notion (referred to by linguists as 'endonormative') (1) that there is a model that is arrived at, that constitutes the centre of gravity in all this variation; and (2) that the model is established within the community, not taken over from outside. And in particular, in the case of English, this implies that the model need not be—in many cases will not be—any of the native Englishes, whether that of Britain, America or anywhere else.

This is not a new idea; it was being propounded, for example, by Peter Strevens when he worked in the University of Ghana in the 1950s: that there was a 'West African English' with its own norms and that this, rather than British English, was what learners in West Africa would take as their model. When this view was put forward by Strevens and other British applied linguists in the 1960s, we were strongly criticized by some of our American colleagues, who rejected it entirely and indeed called it the 'British heresy'. They felt, at that time, that one had to take as the model some first language, mother tongue variety of English; otherwise, the language would go flying off in all directions. But in fact this is due I think to a misunderstanding of the functional basis of language. The functions of English in Singapore are defined by reference to Singapore, not to America or Britain; English has a central place in Singapore life—it is used among Singaporeans in educational and many other contexts, and it is a language of Singaporean culture. Singapore English is a reality; and part of that reality, it seems to me, is a clear if intuitive sense among Singaporeans of what they regard as its standard forms. The features that they recognize as standard are not the same as those of Standard British—they are neither the antiquated standard of Somerset Maugham's time, nor the real forms of Standard British English as this is spoken in the different parts of Britain today.

The next prediction one can venture to make is this: that recognizing these facts will not make Singapore English go down the drain. Rather the contrary, perhaps. It

could turn out that to recognize, describe and promote Standard Singapore English will tend to help keep the standards up, because it gives status to a form of English that people (1) can hear in use, that they (2) can identify with and that they (3) have some hope of attaining to themselves. But let me add, to those who hold that language is either good or bad and that only one kind of a language can be good, the concept of a 'Standard' is a functional concept. The standard forms of a language are no better, or worse, than any other varieties; they just have a special function in society. That is how the phenomenon of standard languages arose; and that is why in practice, it seems to me, there already exists the concept of a standard variety of English in Singapore.

What I have been doing is to take the general principles that I discussed at the beginning of this lecture and see how they could be applied to English in Singapore. Looking at what has been happening elsewhere, we should not be surprised to find, in relation to Singapore English, a wide range of variation in performance, varying around an internationally intelligible centre, some strongly held attitudes to English, and the emergence of a specifically Singapore standard. Is there anything we could say about the other languages, and their relationship to each other and to Singaporean English?

As far as Chinese is concerned, we should not be surprised to note the success of the 'speak Mandarin' campaign, because it makes good sense in the present context. The Chinese dialects, while clearly still having a place in Chinese society, are functional in Singapore—particularly for the new generation growing up in Singapore—only in a backward-looking perspective, as a link with the past, whereas if Chinese has a place, as it clearly has, in a forward-looking perspective on the Singapore scene, then it would seem to be Mandarin that is the relevant variety. What kind of Mandarin? Again—as with English—it is likely to be Mandarin with a Singaporean flavour. It will probably have a Singapore accent, and some local words and grammar in it, including some transported from the dialects. There is likely to be quite a lot of variation in the way people speak it; and perhaps also the emergence of a specifically Singaporean Standard variety: SSC 'Singapore Standard Chinese' to parallel Singapore Standard English, SSE. The newly formed Chinese Language Society will no doubt play a central role in codifying Singapore Mandarin, under its local name 華文, 華語 (which are not used in China), and in researching into ways of teaching it, its role in Singapore society and so on.

But let me here bring in another, perhaps rather different perspective. As everyone is aware, English has been adapted to many cultures around the world; and by the same token, it is also adaptable to the culture of Singapore. English is becoming, has become in fact, a language of Singapore culture. A language is a very flexible instrument for constructing discourse; and one forgets, sometimes, how much each language has already adapted itself over the course of history to changes in the society and the culture along with which it evolved. Consider as an example how radically English was remoulded during only a few centuries to accommodate different literary ideologies: Elizabethan lyrics, the drama of Shakespeare and his contemporaries, the metaphysicals, Milton's epics, eighteenth-century classicism, the romantics, and the literature of today; and then

compare all these with the way we saw the language evolving as scientific discourse; with the emergence of political discourse, and so on. Does the same principle apply to Chinese, then, and to the other languages of Singapore—will they also readapt to changing demands? Certainly they will. We have seen how Chinese has evolved as scientific discourse; this is Chinese developing new meaning styles, to take on a new cultural domain. And we can follow the development of Malay as used now in Malaysia. While a language and a culture have developed and evolved together, they are not inextricably bound. Any language can take on other cultures, and any culture can be expressed through other languages. We see this happening all the time, as a natural process; and it is a necessary assumption behind most language planning.

Here, I have raised the question of Singapore English and said a little about the other languages of Singapore, but not very much about the relationship between them. We refer to Singapore as a multilingual society; what would experience elsewhere suggest that this implies?

Logically, it might imply that all speakers use all languages for all purposes. But this never seems to happen, either in multilingual families or multilingual societies; it does not really seem to make much sense. In all real situations, while there is likely to be some overlap between them, in general the languages tend to be complementary to each other in the ways in which they are used.

This may be a simple regional complementarity, as it often is in European countries. In Belgium, for example, one half of the country speaks Dutch and the other half French. Traditionally, since Napoleon's time, French had been the dominant language; but when in the 1930s, the people wished to restore the balance, while the Dutch speakers were willing to learn French, the French speakers were not willing to learn Dutch, so the country has a clearly marked language boundary drawn down the middle. In Switzerland, people usually speak one language all the time in their own region, but switch if they travel to a region where another one is spoken. More often, however, taking the world as a whole, the kind of linguistic complementarity we find in multilingual societies is **functional**: that is to say, people switch among two or more languages not according to where they are but according to what they are doing. A typical instance of this is the situation known as diglossia, where people have one language for everyday, informal purposes and another one for more learned and formal purposes. This kind of complementarity occurs at various levels: that is to say, people may be switching between a dialect and a standard variety of the same language, or a colloquial and a classical, or a vernacular language and an official language. There may of course be more than two languages involved in a situation of this kind; but in any case, the varieties in question are complementary in their functions—they have different domains, different areas of responsibility in the society. Another way of saying this is to say that they are complementary as regards the registers in which they are used.

Now we might try to define the situation in Singapore by saying that, for example in the case of a speaker of Chinese, Mandarin and English are complementary in that Mandarin is used for expressing Chinese culture and English for expressing—what? British, American, Australian culture? Yes, if you are

specializing in English, studying English literature; here, English will be used in the context of one or more of the native cultures—but that is a minority function. World culture?—Again yes, for some of the people some of the time. Singaporean culture? —But where does Singaporean culture end and Malay, Chinese or Indian culture begin? And in any case, if languages are not culture bound—and we have shown that they are not—why do we need two or three or four languages for the purpose? Could we not simply tell the whole story in English, or in Malay?

Now of course, as I have emphasized in answers to various questions, one does not need to justify learning languages; it is desirable for its own sake, for a wide range of educational, personal and practical reasons. So one might simply refer to these reasons and say that it is desirable for all Singaporeans to be bilingual, or trilingual. But in that case one would expect a wider range of language choice, to include Japanese, Russian, Spanish, Hindi and so on, whereas Singapore identifies certain specific languages as the official languages of the country and requires everyone to be proficient in two of these, with English being one of the two.

When one tries to interpret this in functional terms, it is the word 'culture' that keeps getting in the way. Now it is true that it is easier to **transmit** many aspects of Chinese culture in Chinese than it is in English, and similarly to transmit Malay culture in Malay—for reasons that have already been suggested, because of the unconscious meaning styles that are built into the language, which embody and enact the behaviour patterns and the systems of values. But it is not necessarily any easier to talk about a culture in the language of that culture than it is in some other language—just as one can equally well write a grammar of the English language either in English or in Chinese. In these cases, one is using a metalanguage, and the relationship to the object (the culture, or the grammar) is quite different. But all this is really beside the point, because the kind of complementarity that is set up among the languages of Singapore is not I think primarily a cultural one; it is a **functional** one. In my view, looking from the outside, multilingualism in Singapore is best understood not in terms of cultural complementarity but in terms of functional complementarity. To put this in less pompous words, the languages have different jobs to do. And that is why the language policy makes sense, and why it works.

As I see it, apart from certain specific functions that Malay has as the national language, English is the language of administration and learning, including most of the processes of education; while the other official languages function in most contexts of personal and social interaction. They are not insulated from each other; functional complementarity does **not** mean that there is **no** overlap, and it is highly likely that there would be a partial overlap, with some English used in home and social occasions and some Chinese, Malay and Tamil used in the schools. This is the picture which I have been building up, rather than one in which the languages are firmly tied to the cultures. It is enough to say that these are the actual languages mainly spoken by Singaporeans; it is natural that their speakers should mainly choose to study the language they already know, or that is the language of their family background. But I would expect that increasingly Singaporean children will opt for one of the other languages, just as Australian children are beginning to choose languages other than those of their ancestors or their relatives back home.

As I said at the beginning of this series of lectures, I have been mainly concerned to explore questions that take us beyond the confines and the contexts of Singapore; partly in order to establish, and to draw on, general principles relating to language and learning, and partly—as today—to refer to comparable contexts elsewhere: to other languages, to English in other environments, and to other communities with complex linguistic profiles, whether of languages or of dialects, or of both. I have ventured, here, to try to apply some of these principles, and comparative observations, in interpreting the situation in Singapore. Please accept these as what they are: attempts to understand a very complex part of a total picture.

I think it is often helpful to have a specific context in which to discuss issues of this kind. My context on this occasion has been the theme of the series as a whole, which is language and learning. The functional load carried by the different languages in Singapore is obviously a major element in their relationship to learning in general, just as the status of and attitudes to Singapore English are major factors in language education in school. In the final lecture I shall maintain this functional perspective, asking what our learners are expected to achieve with language now, and where these expectations are likely to take us in the future.

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Chapter 8
Languages, Education and Science: Future Needs

This final lecture is more in the nature of an orientation, aligning the motifs in such a way as to say something about the direction in which our enquiries and our efforts in language education might seem to be going. I have been looking at learning, including (though not restricted to) learning in the sense of education, or 'becoming educated', as a linguistic kind of process, and I have been trying to see it from the point of view of the learners, taking account of the languages that they meet with, and have to master, along the way, and of the resources that they bring to the task at each new step. In each lecture, I have focused on a particular aspect of language education, approaching it from a specific angle. But at the same time, I am aware that there was a great deal of intertextual reference—including probably some that I was not aware of at the time of preparing the talks; but much of it deliberate, in the sense that I wanted to suggest that, to me at least, those topics all form part of an overall package—package not in the sense of a parcel, but in the sense of a package tour. The itinerary was meant to take in a wide and varied terrain, with many different encounters along the route, while at the same time giving the feeling that one was travelling, not aiming at some prefixed destination, but having a sense of where one had been and an anticipation of where one might be heading next.

One perspective that I have been trying to present—not exclusively, because I do not want to be exclusive—is that a learner, in learning any subject (and by that I mean any definable domain of experience, with school subjects as a particular instance), is learning language. More specifically, he is learning the language of that subject, not in the narrow, field-determined sense, the **words** that embody its content, but the language in which that subject is codified and transmitted, including teacher talk, textbooks, field notes, examination questions, peer group discussion and so on—all the language that is involved in the various activities through which the subject is learnt. The way of referring to this that came into fashion in the 1970s was learning the **discourse** of the subject. I have been using this term myself—the discourse of science, for example, but it needs to carry a warning sign with it—it is to be understood as 'learning the discourse of the subject, and **the system that lies behind that discourse**'. Why is this warning needed?

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When I first came into linguistics, a long time ago now, linguists had focused their attention almost exclusively on language as a system. This was the legacy of Saussure, whose great achievement was to show how the **system** of language was related to the observations that we make of language use. But the very power of his ideas pulled all researchers in that direction, and it was difficult to get anyone to take seriously the study of text in its own right—more or less the only linguists who did were those of the two schools of London and of Prague. Then, as so often happens, when the reaction came, the pendulum swung right across to the other side and all attention came to be directed to the study of texts, or 'discourse' to give it its new name; and now one has to struggle to get the **system** of language back into the focus of attention. But if we want to understand how people learn, we have to be aware both of the **discourse**—what people say and write, and listen to and read—and of the **system** that enables them to do so: the potential they have for creating (and understanding) the forms of discourse, a potential which is constantly changing and expanding in the process of its use. It is this system, the potential for meaning, that is a learner's principal resource.

Now one of the great disservices we do to our learners is to deny them this sense of their language as a learning resource. In a great deal of educational discussion, the marvellous richness and power of language is simply trivialized. Much of the public debate takes the form of people making rules about language and seeking to impose these rules on others, or else (the reciprocal of that) of looking anxiously over their shoulders to see if they are being followed by these linguistic police, and having their confessions already written out. I have been pursued while in Singapore with questions of 'Is this correct? Was the writer not wrong to write that?', and my authority has been sought for condemning the whole of Singapore English as one writhing snakepit of errors. All this suggests a high level of anxiety about language in the Singapore population, which could make it a very negative environment in which to learn. Since people clearly do learn, and on the whole seem to learn rather successfully, in Singapore schools, it may be that they take no notice of these stern linguistic lawgivers, and this might suggest that it is not worthwhile raising the issue here. But I think it is, very briefly at least, since what this kind of discourse does is to debase language, to take all the value out of it; and it does this by foregrounding what are largely questions of etiquette, or linguistic table manners. The protagonists see language in terms of rules of good behaviour. It is rather as if, while the farmers and the cooks were trying to improve the quality and the food value of rice, the consumers were devoting their energies to a sterile debate about whether the rice should be eaten with the fingers, with chopsticks or with a spoon. To treat language as a set of rules of behaviour is to trivialize it beyond all recognition—and hence, to distract attention from the real issue, which is the quality of the language and its nutritional value.

Perhaps it might be useful at this point to say something about what is meant by the term 'grammar', since grammar is at the heart of the system of language. Grammar is a resource for meaning. It is the sum total of all the possibilities that a

language has for creating meaningful discourse: the potential that lies behind everything that you can say, or write, or read, or understand. One common way of looking at it—though it is one I do not personally find very helpful—is to say that a grammar is all the words of a language plus all the possible ways of arranging those words into sentences that make sense. I prefer to think of grammar as a form of choice. There are various ways of describing the grammars of languages; perhaps the salient distinction here is that between the formal approach and the functional approach—these are the two basic perspectives on grammar, and they bring out different aspects of it. A formal account of a grammar takes the forms as point of departure and is primarily concerned with formal relationships. A functional account takes the functions as point of departure and is primarily concerned with **semantic** relationships. My personal opinion is that in language education, a functional approach to grammar is more rewarding (not all linguists would agree with me), and within the functional approach, I find it most helpful to interpret grammar as choice—as a resource for making choices. The choices are, first of all, choices in **meaning**; but, at the same time, they are choices in the words and structures through which the meanings that are chosen are put into effect.

A learner is someone who is increasing his potential to mean: increasing his power by constructing and constantly expanding his resource that we call language, which has the grammar as the core. What you can think of as the output of the grammar, if you are speaking or writing, or else the input to it, if you are listening or reading, is a system of **expression**: a sound system, for speaking and listening, and a writing system for writing and reading. All languages have sound systems, that is how language evolved. Only some of them have writing systems; that form of expression came very much later in human history—with agriculture, and settlement—and correspondingly comes rather later in the life of a child. Having two media of expression rather than just one again increases the total power of the system; first in the obvious way, namely that you now have two channels for learning instead of one, but also because, as I suggested in discussing scientific English and also scientific Chinese, the written language opens up new meaning styles, new ways of organizing discourse. And in learning any particular subject, I suggested, there are likely to be certain aspects of the subject that you can learn more naturally through speech, and other aspects that will be learnt more naturally through writing.

Our concern as educators is to help learners increase their total potential to mean, using both media (speech and writing), both as input and as output (both receptively, in reading and listening, and productively in writing and speaking). Now, in a bilingual situation, they have to master the grammars, and the input–output systems, both the spoken one and the written one, of two languages. Like all learners, whatever it is they are learning, they will make mistakes, and there will be limitations on what they can do at any given time. Making mistakes while learning is an entirely positive step, not something to be punished for or to be ashamed of. We do not scold a child who falls over while learning to walk, nor do we make him go back and start again just because he has not kept his feet straight. The same will be true of a language learner, at any age: he is going to fall over now and again and

get his feet in the wrong place. What matters is whether he arrives at his destination: whether he managed to get where he wanted to go. In other words: as teachers, we are concerned that the learner should be learning effectively; we need to recognize if he has failed to understand, or failed to communicate what he has understood, and we do need tools which will help us put him right. This means, when the learning problems are problems of language, we need some understanding of grammar; but grammar in the real sense of the term, not in its debased sense of a set of rules for elegant behaviour.

Now with regard to the language of the educational disciplines (and although I used science as my main example, the point is valid for other fields as well—history, literature and so on), we notice a kind of tension, between two forces pulling in opposite directions, and I think this has some significance for teachers at secondary and tertiary levels. On the one hand, this kind of learned discourse (including what we find in the textbooks) tends to privilege the expert, the one who has already learnt something: its grammar is constructed in such a way that one has to know in order to understand. Technical and mathematical discourse in particular tends to proceed in fairly tight linguistic sequences, so that in building up **new** information one is required (and assumed) to have access to certain sectors from the information that has gone before. This tends to create a distance between educational language and other, more everyday varieties. At the same time, there are other forces restraining learned language from getting too cut off from everyday discourse. One of these factors is that, however esoteric this technical language becomes, even in the most specialist writings, it still has to keep in contact with those other registers. Researchers, after all, get most of their ideas while chatting over coffee in the lunch break, and they chat in casual spoken language, not in the densely textured written language of the research report. It is essential that **learners** should similarly be able to chat about whatever it is they are learning. It does not much matter what language they use for the purpose, since different languages will tend to reinforce each other in the process of being used for learning with—this is a good example of functional overlap, between languages which are in general complementary in their functions. At the same time, it is valuable for the learner to be familiar with other registers of the language that are being used in the textbooks (English in this case), since, however much the written language of a particular school subject has its own distinctive grammar and semantics, it is also drawing in large measure on the general 'core' lexicogrammatical resources of the language. Even highly technical English is still a kind of English; it is not a totally different semiotic system.

Up to this point, I have been attempting to draw together threads from what I have been discussing before. So let me move on from here and take up what are the three main aspects of this final excursion into 'language, education and science: future needs'—or perhaps I could as well have said future pointers. One is to note the power, the meaning potential I have called it, that is embodied in the range of the registers—the functional varieties—of Singapore English, and to think of the learner as someone who has to gain access to, and mastery of, that potential. The second is to consider the directions that language itself is taking, in keeping up with

the frontiers of human experience and human knowledge. And the third is to re-examine the role of linguistics in these various contexts, and to see how the study of language intersects, in a large number of places, with other fields of study and research—including of course with all that goes on around this campus.

In an earlier lecture, in speaking on the topic of language and culture, I understood 'a culture' in the usual sense of this term: Western culture, Chinese culture, Singaporean culture and so on. And I came to the conclusion that this concept rather got in that way of our understanding and obscured the issue. So let me adopt my usual strategy of thinking about things linguistically. Let us think of culture, for the moment, not on the dimension of dialect but on that of register: not as the meaning systems and behaviour patterns and beliefs and values of the Chinese or the Cantonese or the English—the things that we traditionally think of as encoded in these different languages or dialects, but rather as the meaning systems and behaviour patterns and beliefs and values that are encoded in different **registers**. In this sense of culture, since we all use language in a number of different registers during the course of our lives—and even during the course of one day—we all participate in a number of different **cultures**. And clearly these cultures do not correspond to divisions of language; they cut across distinction like those between Chinese and English and Malay, or their various dialects. If, for example, you are working in computer science, then you are participating in the **culture** of computer science whether you happen to be reading and writing, or programming, in English or in Chinese. Culture, in this view of it, is related to the sense in which C P Snow used the term 'the two cultures', back in the fifties, to refer to the sciences and the humanities; but I am not implying any such degree of opposition or insulation, nor in fact do I want to set up a duality of this kind at all—I want to take account of the whole cultural variation that is enshrined in our register range, the functional variation that occurs in all our languages.

In this sense of culture, then, what the learner is doing is gaining access to, and power over, a wealth of different cultures, the cultures that collectively constitute the society he lives in. To be educated means to have access to enough of these cultures to have some degree of control over one's own life: so in the sense not only of being able to **understand** the discourse but also of being able to **evaluate** it, to recognize the system of meanings that is being presented and the values and assumptions that go with them. So—with English as our working language—let us take a very quick look at a few passages of English written in Singapore.

The texts, which I will be referring to, are arranged in pairs; the point of each pair is to show both a similarity and a difference. Each pair presents one component of Singapore semiotic styles, while within each pair, we see a further distinction between two rather different kinds of message. To know Singapore English, to have access to knowledge and power through the meaning potential of the language, and of its different registers, is to have a sensitivity to similarities and differences of this kind.

Text 8.1(a)

Discussions and Conclusions

An innovative grouping algorithm has been developed by studying the functional dependence of Mandarin homonyms. This algorithm is capable of characterising and classifying the entire 1240 Hanyu Pinyin homonyms in accordance with the word templates of the speech recognition patterns. By applying the algorithm, it is possible to reduce the homonym groups to about a quarter, resulting in a reduction of about 75 %. The response time gives a threefold to fourfold improvement. For well-trained homonyms, a high recognition rate of 99 % is achievable with the average response time of 2.06 seconds for PC and 0.66 seconds for AT, respectively. These figures are very close to real time even with the addition of other possible overheads such as the data transfer between the host and the card and the generation of character display, which are estimated to be about 0.3 seconds.

Some constraints likely to affect the results are the consistent pronunciation of speakers, background noises and statistical variations of repeated utterance. As indicated above, the recognition rate is rather sensitive to training procedures. For the sake of consistency, we have defined a strict training procedure and used prerecorded tapes for our analysis. The tapes are recorded by persons who, though not professional phoneticians, are quite consistent in Hanyu Pinyin pronunciation. This makes it possible to achieve the higher than usual recognition rate, which may be difficult in a live environment.

Text 8.1(b)

Contrary to what most people believe that Chinese is an ineffective language, it is more than twice (2.08) better than English in terms of representing an information.

If we understand the tremendous amount of information being possessed, used and communicated by people daily, this is something which is not going to be taken lightly. Many people blame the Chinese language for holding back the progress of China in the last few hundred years. Is this true?

The other question is on the Pin Yin'ized of the Chinese words. Chinese words are ideographic in form and there have been claims that the Chinese words are difficult to learn and memorise. Many researchers propose to replace the characters with Romanized Pin Yin, i.e. to change the Chinese writing into alphabets so that it can be easily adapted to keyboard, easy to learn and remember. The present study show that if this is done, the amount of storage space requirement for the Chinese will immediately be more than doubled (2.38 times). The thickness of books will be doubled; the newspapers will be thicker; and you spend more money in sending out the message through computer communication. The disc space would also be doubled. The Pin Yin is supposed to be easy to learn and memorize, but there has been no careful study to support such claims.

However, as the sample size (204,077) is still too small, this remains a preliminary study. Final conclusion can only be drawn from a more comprehensive study which involves a very large manpower.

To use these texts professionally, the reader has to be familiar with the technical register of computer science; the passages I have selected here are not among the more technical ones, but to understand the papers as a whole the reader has to have mastered the general structure of technical and scientific discourse (particularly those features I referred to in discussing the evolution of scientific English), plus other features specific to computer science. But on the other hand, one does not need such technical knowledge in reading these two passages to be aware of an

important difference between the two. Text (a) is exploring a question, whereas Text (b) is proving a point. The writer of Text (b) does not like Pīnyīn (Chinese Romanized script) and is anxious to prove that books written in Pinyin would be much heavier to carry around—even heavier than those written in English, whereas those written in Chinese characters are much lighter than English ones (he even says earlier on 'I always wonder if the size of the book has something to do with the physical size of the race—most Westerners appear to be bigger and stronger than Asians'!). Thus, although the field of the discourse is the same, the rhetorical mode of the two articles is quite different.

Text 8.2(a)

rsvp regrets only

the ability to read road maps
or do sums, for example, can be described
in terms of an invitation.
one can always ask a further question
about any invitation: what's the good
of learning placenames, peoplenames, & how many
litres are there to the gallon?
unasked, regrets only.

the trouble, though, is that of deciding
what sort of thing is necessary to make
an invitee's autonomy. is it logically
necessary to be unable to prattle,
flip a drink neatly down, or what?
the card is invitational &, therefore, purportedly
carries a value, judgement it does not.
not that it means
regrets are what are being invited.
it is, after all, a filler problem.
the ability to read a number,
use a dialling finger, for example, can be
circumscribed in terms of a contingency.

Text 8.2(b) 2 mothers in a hdb playground

ah beng is so smart
already he can watch tv & know the whole story.
your kim cheong is also quite smart,
what boy is he in the exam?
this playground is not too bad, but I'm always
so worried, car here, car there.
at exam time, it's worse
because you know why?
kim cheong eats so little.
give him some complan. my ah beng was like that,
now he's different. if you give him anything
he's sure to finish it all up.
sure, sure, cheong's father buys him
vitamins but he keeps it inside his mouth

& later gives it to the cat.
i scold like mad but what for?
if i don't see it, how can i scold?
on Saturday, tv showed a new type,
special for children, why don't you call
his father buy some? maybe they are better.
money's no problem. it's not that
we want to save. if we buy it
& he doesn't eat it, throwing money
into the jamban is the same.
ah beng's father spends so much,
takes out the mosaic floor & wants
to make terrazzo or what.

we also got new furniture, bought from diethelm.
the sofa is so soft. i dare not sit. they all
sit like don't want to get up. So expensive.
nearly two thousand dollars, sure must be good.
that you can't say. My toa-soh
bought an expensive sewing machine,
after 6 months, it is already spoilt.
she took it back but … beng,
come here, come, don't play the fool.
your tuition teacher is coming.
wah! kim cheong, now you're quite big.

come, cheong, quick go home & bathe.
ah pah wants to take you chya-hong in new motor-car.

Texts 8.2(a) and (b) are two passages from poems by a well-known Singaporean poet, Arthur Yap. In the first, we might say he is writing in Standard Singapore English, which in its written form is very similar to other standard varieties. Now, as a writer, the **individual style** is likely to be more distinctive than the question of whether it is Singaporean or American or British, although the writer may of course use this language, in his own individual way, to reflect Singaporean experiences or Singaporean themes. The point about poetic and other literary discourse is that the text is a highly valued object in itself. We may be interested in its similarities and differences with other texts; but it is the **text** that is the **object** (of value and of study) rather than the register to which we might assign it. And if we try to infer from the text something of a world view, then again it is the world view of the **author** (at least in our modern ideology) that we are interested in. Text 8.2(b) is also by Arthur Yap; but here he is writing in Singaporean dialect [compare this with the Yorkshire dialect poem in Text 7.4(b)]. It is clear what the reader has to bring to an understanding of this second poem. But now look back at the first one; is it really so neutral as I have been suggesting? This is also a dramatic speaking voice, and I recognize in it another clearly drawn persona—another Singapore persona, no doubt, although in this instance one with which I am, obviously, on much more familiar terms.

My third example includes two texts from a very different register again, the second one that of a well-known style of soft-selling baby talk:

Text 8.3(a)

Singapore, the name simultaneously conjures up images of Kipling's leisurely lifestyles, Singapore Airline's Singapore girl and the city's modern skyscrapers. In this bustling city, one can still find pockets of old Singapore if you know where to look. Raffles Hotel, the locale of many of Kipling's novels, is still standing with palm trees waving in the breeze.

Singapore is a melting pot of many races as the people are descendants from immigrants. The local culture is derived from different parts of Asia and the traditions of the East are still preserved in the ways of the people. The marvelous and varied cuisine makes Singapore a true gastronomic paradise. One would be able to enjoy Chinese, Indian and Malay food just by walking down the streets of Singapore.

Nature has blessed the island with year-round sunny and balmy climate. It sits at the crossroads of South East Asia with efficient air links to all favourite tourist destinations in Asia: Bali, Fiji, Tahiti, and Mauritus. The modern city provides the material comfort of the West and the people retain the tradition of the East. This combination truly makes Singapore a great place to live in.

In the last two decades a strong manufacturing base in semiconductors, oil refining, aircraft maintenance and other support industries have been built up. The next phase of industry development is towards research and development. In semiconductors, the industry is moving into IC design and wafer fabrication. The magnetic hard disk industry for computer storage is well established. The telecommunications industry is moving strongly into the manufacturing of advanced digital telephone sets and the local telecommunication authority is setting the stage for the future with Televiev, an advanced videotext system with high resolution graphics.

The next phase of Singapore's industrial development would be high technology based. These include biotechnology, information technology, robotics, computer integrated manufacturing, and fee based financial services. The information technology sector is a key sector with the establishment of Singapore as a regional software centre as one of the national objectives.

To assist us to achieve these goals, we need people like you. Talented … dedicated … resourceful. Singapore is dynamic, modern and vibrant. We invite you to join us.

Notice that Text 8.3(a) ends up with the words:

> *To assist us to achieve these goals, we need people like you. Talented ... dedicated ... resourceful. Singapore is dynamic, modern and vibrant. We invite you to join us.*

Who is 'we'? 'We' here is an institute of this University.

Text 8.3(b)

Dear tenant
IF YOU JUST WANNA HAVE FUN…..
Come to your MOONCAKE NITE THEME PARTY next Saturday. That's September 20—from 7.30 p.m. until the wee hours!!
A sneak preview of the exciting line-up of activities includes:

* Mr/Ms Tenant Contest
* Find Your Mooncake Partner
* Pass the Lantern Game
* Bottoms Up Contest
* Blow the Lantern Game
* Moonwalking Contest
* DANCING
* PLUS MORE! MORE! MORE!

For even greater fun, design and wear your original Mooncake creation, and bring your self-made lantern passport!

But don't despair if you can't because this party is FOR you! Lantern passports can be bought at the door.

Just c'mon and grasp this opportunity to chat up your neighbor. Call yours truly on ext. 137 NOW! Confirm you really wanna have fun!! Why—September 20's next Saturday.

See you!

This text is hard to describe—we might say it is indescribable; it represents an extreme form of American-imported paternalism ('maternalism' would perhaps be more accurate) in which adults are addressed as if they were children, perhaps on the assumption that they are in fact adults with **minds** like children (the linguistic equivalent of fast food and ice cream). This form of discourse is presumably taught, along with the smile, at schools of hotel management. It represents what we might call the Disneyfication of Singapore English.

Finally we might look at two newspaper extracts:

Text 8.4(a)

Grads' infertility may be linked to stress: Prof

By KONG BOOK CHIN

A NEW problem has cropped up for graduate women — this time for those who are married.

Doctors are beginning to notice that more and more of them are seeking help because they cannot have babies.

And stress has been associated with the inability to produce eggs.

This blow comes even as attention is being paid to the likelihood of many single graduate women remaining unmarried.

Affects others

The latest trend on infertility reveals that married graduate men are also affected. More have been found to have a low sperm count.

Doctors think the stress they and women graduates bear in carving out successful careers for themselves could be linked to their infertility.

This emerging picture, observed by Professor S. S. Ratnam of the National University of Singapore, also affects other non-graduate career-minded people.

Prof Ratnam, who is head of the university's obstetrics and gynaecology department, said stress upsets their hormonal balance which could lead to no egg production or low sperm count.

Even what is not usually regarded as a very stressful situation, such as moving house, could upset a person's highly-sensitive hormonal balance, he said. Sitting for examinations would also be stressful for some people, he added.

Prof Ratnam: One in seven couples with problems having babies.

Hormonal imbalance is now a major cause of infertility here and doctors have been seeing more of these patients, Prof Ratnam said.

As more women go for higher education and join the workforce, some would become victims of stress too, just like some men.

What does not help is that a graduate woman's prime reproductive years — from her early to late 20s — are also competitive years spent chasing a degree and climbing the career ladder. A woman's fertility declines after 30 and more drastically after her 35th birthday.

A man's ability to father children is not so restricted by age. Even in their 60s or 70s, some men have fathered children. But their sperm production could be affected by stress.

Caution

Dr Ratnam, who is also head of the National University Hospital's O & G department, said one in seven Singapore couples have infertility problems, taking all causes into account. This ratio is similar to that in some developed countries.

The growing stress problem here is because modern living has become more fast-paced life, he said.

For women other causes include ovarian disease, fibroids in the womb and blocked fallopian tubes. For the men, they could have varicose veins in the testes, or the opening of the penis is not at the tip but along the shaft, making it difficult for them to impregnate their wives.

Prof Ratnam cautioned some women against thinking that operations such as those to correct a tilted womb would help. Instead, surgery could damage the woman's delicate reproductive system.

"I would advise all women told to go through surgery to help them conceive to seek a second opinion. Very often, surgery is not the answer," he said.

Another gynaecologist said such operations were not uncommon here. He had seen many patients whose reproductive systems had been impaired by operations for which they had paid several thousand dollars.

Prof Ratnam said treatment for infertility, including hospitalisation, would cost an average of $3,000 to $4,000.

It is harder to treat male infertility because doctors do not know as much about the man's reproductive system.

Still, there were ways to help the men, he said. One was through hormonal tablets to stimulate sperm production.

A recent development here which could also help is the the battery-operated fertility pump which releases hormones regularly into the body to stimulate sperm production.

Or if their poor sperm count is due to varicose veins in the testes, the problem can be solved surgically. And if his sperm count is not too low, the best could be used in the GIFT (Gamete Intra-Fallopian Transfer) programme to help the wife conceive.

Women can be helped with fertility pills and injections, the fertility pump, the test-tube baby, and the GIFT programme too.

Text 8.4(b)

Girl grads will still outnumber the males

Imbalance in sex ratio a result of the educational structure

MORE boys than girls in primary schools; more girls than boys in secondary schools.

There used to be more boys than girls at secondary level, too. The girls caught up with the boys in the early seventies, and have since left them behind.

Why this switch in sex ratio? More importantly, what are the long-term social implications of such a development?

Some teachers say that in general, girls are more academically inclined. Two sets of statistics tend to support this view:

- THERE are a lot more girls than boys in junior colleges.
- FAR more boys than girls go to vocational and industrial training centres.

Education system

Because of the structure of our education system, more girls than boys end up with university degrees.

In 1984-85, 2,117 women graduated from the National University of Singapore and 56 from the Nanyang Technological Institute. In the same year, 1,337 men graduated from NUS and 501 from NTI.

Our polytechnics draw more male students than females. In 1984-85, 2,178 men graduated from the Singapore Polytechnic and Ngee Ann as against 1,233 women.

Women, however, outnumber men when it comes to studies at the Institute of Education, with 589 of them graduating in 1984-85 as against 139 men.

Now we come to the delicate issue of marriage. For years, women have been brought up to believe that they should marry men who are better educated, or at least their equal in education level.

Same belief

Men, too, have been conditioned to the same belief, that is, they should be the dominant partner in marriage.

Unless we change this norm, and emphasise other equally important qualities such as sincerity and integrity, we will have a big problem ahead of us.

In 1984-85, we produced only 1,838 male graduates against 2,173 female graduates.

The gap between girls and boys in junior colleges has widened from 794 in 1983 to 1,118 in 1985.

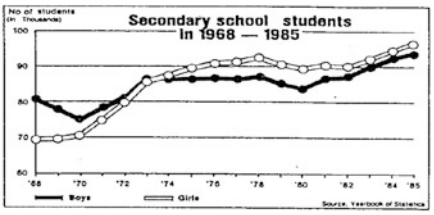
So it is likely that we will continue to have more female university graduates in the years ahead.

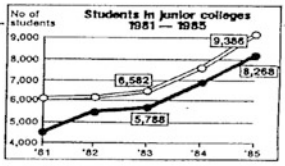
What is to be done? It boils down to changing the expectations of females, and the chauvinism of males. Will our society shed its prejudices? — Petir.

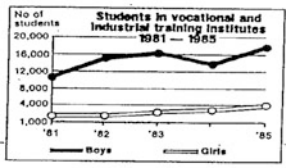
QUOTE

‘For years, women have been brought up to believe that they should marry men who are better educated, or at least their equal in education level. Men, too, have been conditioned to the same belief, that is, they should be the dominant partner in marriage.

Unless we change this norm, and emphasise other equally important qualities such as sincerity and integrity, we will have a big problem ahead of us.’







Male and female graduates

	National University of Singapore		Singapore Polytechnic		Ngee Ann Polytechnic		Institute of Education	
	Male	Female	Male	Female	Male	Female	Male	Female
1980/81	1,117	1,070	1,694	469	493	102	222	102
1981/82	1,254	1,141	1,838	586	492	259	152	259
1982/83	1,397	1,508	1,965	561	585	343	138	343
1983/84	1,583	1,826	2,148	615	834	459	178	459
1984/85	1,337	2,117	2,223	644	953	589	139	589
Total	6,688	7,582	9,768	2,875	3,357	1,752	829	1,752

1984/85 — There were 501 males and 56 females graduated from the Nanyang Technological Institute

These show the kind of linguistic contrast that you would expect to find between the page labelled ‘news’ and the page labelled ‘comment’. On the news page, Text 8.4 (a) gives an account of the present state of the findings in an ongoing investigation into the relationship between infertility and stress; it is explicitly presented as a medical report (that is, as something with a specific kind of authority behind it), and where opinions are expressed, they are clearly attributed to a specialist in the field.

Text (b) comes under ‘comment/perspective’; it is a statement of opinion, in an analytic and hortatory exposition (to use Martin and Rothery’s terms). It asks questions and brings facts and figures to bear accompanied by charts to answer them (not always as explicit as they seem, e.g.

> *‘Because of the structure of our education system, more girls than boys end up with university degrees'.*

– **why** this should follow from the structure of the education system is left to be assumed); it issues warnings about the future, and about what will happen ‘unless we change this norm’, and ends with a rhetorical flourish:

What is to be done? It boils down to changing the expectations of females and the chauvinism of males. Will our society shed its prejudices?

As in all these texts, the grammar encodes the complex of semantic choices, which in turn create for us the context of situation. Even a reader who previously knew nothing about Singapore or its current concerns could construct much of the background out of these passages of discourse, in the way that I described in my earlier discussion (Lecture 5) about register theory and the relation between meaning and context.

Now, these passages represent some small fragments of just a few registers of the English of Singapore as it is being written today. They are fragments of Singapore cultures, in the way I am using the term. They can be characterized and described and explained in linguistic terms, with grammar (in the sense of grammatology, 語法學) as the principal tool for showing what are the significant features of texts—why they are written the way they are, why they convey the meanings they do convey, and in what ways they may be effective (or not so effective, as the case may be) in relation to their particular functions. This is a very important use of linguistic theory and method, as it can be applied in language education.

I hope it is obvious from these examples that English in Singapore is like English in its native haunts in the way it adapts itself to meet all these different functions. There is much more in common between a given register in Singapore and its equivalent in London or Sydney (compare, for example, the parallel sections of the Straits Times and the Sydney Morning Herald) than there is between one register and another in either. Again, it is the **functional** variation in language that represents the significant patterning in the culture. This is not to say that all registers are held in common between, say, Australia and Singapore; they are certainly not. Those that are more squarely within the functional domain of the other language of Singaporeans tend to be much more different from their Australian counterparts (and of course, most Australians still do not speak a second language, so one whole dimension of meaning potential is missing). But I think these are enough to bring out the point that English functions as a language of Singapore culture, in that all these writers make the language work for them in the way that that implies—with a high degree of thermal efficiency. In doing so, they are creating powerful modes of discourse, which all Singaporeans have to learn to control.

And this leads to my next point, which I will introduce with the not very original observation that the world is changing: I want to consider some of the effects this is having on language—our ways of meaning, and of storing and exchanging information. The changes that are happening now in all our semiotic activities are as great as and probably more rapid than earlier semiotic changes that constituted what Europeans called their renaissance, say from the beginning of printing (much later than in China) to the age of Newton. Most obvious of these, perhaps, is that **speech** and **writing** are no longer two clearly distinct modes for the expression of language: they are getting mixed up together, in all kinds of intermediate forms. We can speak into a tape recorder and transcribe the text into writing; we can compose on a

computer and have the written text scrolled up the screen, so it is strung out like speech along the time dimension, and soon with text-to-speech systems, we shall be able to have it read out to us by the synthesizer; then, in another ten to fifteen years, perhaps, we shall be able to speak into a recognition system, and that will complete the cycle (the cycle that began perhaps about fifty years ago with dictaphones and those illuminated headlines that used to scroll along the parapets of buildings). So, at this level of language **substance**, one effect of the technology is that instead of two clearly distinct variations of text, a spoken and a written, we now have a whole continuum of mixed types—texts which have some of the features of each.

These suggest that we shall probably see some new forms of publication, for scientific texts—among others perhaps, for example, textbooks which are simultaneously scrolled on the screen and read aloud, or which proceed by alternating between the two. (They may already exist; if so, I have not seen/heard one yet.) (We shall need a new verb for simultaneously listening and reading.) Such formats also invite new literary forms, and again these may already be in existence: one obvious motif would be a variation on the concrete poem, but moving instead of static, again with simultaneous or alternating segments of speech. All these things have certainly been thought of and are probably now in production. One thing I find interesting about them is the possibility they suggest of reuniting science and poetry, as it was once united in the work of the Latin poet Lucretius, that I always thought the finest of all the roman poets. A multimodal output system of this kind is surely an invitation and a challenge for the physicist and the poet to combine their discourse into one.

However, changes of this kind are still relatively speaking on the surface of things. We can probe a little deeper into the current semiotic revolution. I have the privilege of being involved, as a linguist, with a research project in artificial intelligence: one of a still not very large number of such projects around the world that is concerned with text generation: that is, the computer as author. Christian Matthiessen, the linguist now working with this project, which is located at the University of Southern California, described it as a 'knowledge delivery' system (Matthiessen 1985). The computer has been supplied with a grammar of English—a rather large grammar, by AI standards—with which it can produce sentence structures for itself, either randomly, in which case of course they do not make any sense (but they enable us to test the programme for mistakes), or under the control of some 'knowledge base' so that it writes meaningful discourse based on some information it has been instructed to use for the purpose. Another way of thinking about such a text generation system, therefore, is as an information handling system, which can convert information presented to it in some other form (for example, measurements of some kind, in the form of figures) into connected passages of English. For example, it might learn to take in numerical information from weather satellites, about air pressure, wind movements and so on, and write it up in English in the form of a weather forecast.

It cannot do that yet; but such things are not far off, with the level of current AI and machine translation research. This, and the comparable research into parsing—that is, the ability of the computer to go the other way, to read and understand

natural language—represents a much deeper restructuring of semiotic processes, which affects not simply ways of storing and transmitting information but ways of **generating** information and **increasing** it. That is to say, eventually the processes can affect our ways of knowing: the forms of knowledge that we use to interpret and—one hopes—to collaborate with our environment.

If we put this step together with the technological changes in the forms of **presentation** of discourse, that I mentioned earlier, then it seems more or less inevitable that, within the lifetime of those who are the pupils and the learners of today, some very different patterns will emerge in our natural languages, in the kinds of grammar that are used for scientific discourse, and (it seems likely) other forms of discourse besides.

We can now bring in a third component to add to our picture of the future, taking up perhaps the previous point of the unity of the two cultures; the scientist and the poet. In fact, of course, even in the West, which favours discontinuities and dualities of all kinds, those two were not always that far apart; as Prigogine has pointed out, it was a strange and destructive by-product of the new post-Newtonian physics that dehumanized science in the minds of Europeans (and I think the forms of scientific discourse, with its rigidifying nominal structures, may have had a lot to do with it) (Prigogine and Stengers 1984). But that does not prevent **every** scientist from being a poet or stop **all** poets from thinking scientifically. I have in mind for example my colleague David Butt's study of Wallace Stevens, where—using **grammar** as his theoretical instrument—Butt has shown the deep consistency of Stevens' view of the world, one which (when you interpret it grammatically) can be shown to be consonant with, and to share some of the important insights of, the view of reality that has emerged in twentieth-century physics (Butt 1988). But Stevens is using the resources of everyday language for the purpose: everyday language, that is, as a poet construes it to create the meanings that constitute his personal semiotic.

If we look to the scientists, in their turn, we find that they are nudging warily in the same direction. We have always known that **mathematics** was an art form—I once asked a mathematician colleague what criteria he was using to judge a slim PhD thesis he was carrying under his arm, and his reply was 'Purely aesthetic ones'. But the work of twentieth-century physicists, from Einstein onwards, has been a constant struggle towards new forms of discourse, as they found themselves trapped in the determinacy of the metalanguages their predecessors had so painstakingly constructed. So these physicists, from Bohr, de Broglie, Heisenberg through to Bohm and Prigogine, have tried to break with natural language—not because it is too slack, too loose, as our logicians are always telling us, but for exactly the opposite reason—because it is too rigid, too precise. They want something with more play in it, more scope for movement and flux and more readiness to accommodate apparently conflicting realities.

But these scholars, brilliant physicists though they are, do not know much about language, and the irony of the situation is that if they did, they would find that the features that they are complaining about in language are not features of our everyday natural languages, but only of the highly contrived metalanguages, with

their excess of grammatical metaphor, nominalization and the like, which they have created—features which we have seen throughout these talks to be characteristic of scientific English, and scientific Chinese, and no doubt others as well. The ordinary language of commonsense knowledge, in its everyday spoken (and informal written) forms, seems to display just the kind of properties they are looking for. It is fluid, dynamic, oriented to processes rather than to things, and it accommodates a whole series of complementary interpretations of reality which seem to contradict each other but somehow manage to coexist in a single grammatical system. (We had a small example of this: tense and aspect as different theories of time. Chinese foregrounds one of these, English the other; but each language can represent both without falling apart.) It is difficult in explicit scientific language to say that something is both wave and particle, or that it is both existent and non-existent at the same time; it is much easier to say these things, although implicitly, in the grammar of daily life.

The problem is, however, that in bringing this grammar to the attention of our **conscious** understanding, we have to use precisely the kind of metalanguage that **destroys** the properties we are trying to understand. It might be that this commonsense knowledge of the world, embodied at the deepest level in the grammars of our languages, is not accessible to scientific investigation—this would be the view of many Eastern thinkers, and while we may smile at the naïveté of Western youth in the 1960s when they suddenly discovered for themselves the mysteries of Eastern philosophy, their extravagances are only the froth on the top: I think most physicists today would agree that the Indian and Chinese philosophical and mystical traditions contain fundamental insights into the nature of—of what? again, the metalanguage is going to destroy it; so let us say just 'contain fundamental insights'. So we come back to the poets once again: they have to be listened to and encouraged to speak to us (but not always in writing: if I may make a plea, as someone who learns—and delights—much more from listening than from reading, will you poets sometimes speak to our ears rather than to our eyes?)—they have to be encouraged to speak to us in the grammar of natural languages, to help us to understand relativity and quantum mechanics and far-from-equilibrium systems and all that.

I cannot write poetry; I can only try to write grammars. But I hope to have persuaded you that that too is a worthwhile enterprise, because it is in the grammars of our natural languages—in English, Chinese, Malay, Tamil, all the others around the world—that the collective wisdom of the human race is encoded. It is buried very deep, in the cryptogrammar, as Whorf was aware, and as I have said, we do not very clearly understand yet how that works. Perhaps we never shall do; this may be another of the absolute barriers such as entropy and the speed of light, although I do not really see why it should be, since a grammar is after all a human artefact—or rather, not an artefact, but a human semiotic. So our trying to understand it better is certainly worthwhile: both the universals, the features that are common to the grammars of all natural languages, and the variables, those aspects where one language may differ from another. The variables are those features where different languages take up, or at least foreground, different options within a common

semantic space. We are still some way from understanding what is the nature of that semantic space; languages have not yet yielded up their secrets—and will not until we have analysed much larger quantities of text than has been possible so far; so here too the computer is making its mark, since with computers we can now at last begin to work with an adequate database for linguistics.

Until now, in discussing language and learning, I have been considering its implications more for the learners themselves and for those who are helping them to learn, parents, other early caregivers, primary and secondary teachers. In these final remarks, I have in mind more the place of language in the context of tertiary study and research.

In Singapore, naturally enough, linguistic studies have developed around the study of English, and the English language programme at this University encompasses a wide circle of topics relating to languages, including the language development of children, in early childhood, preschool and school, language in its historical and social contexts, as well as of course the core components of language —its phonetics and phonology, lexicogrammar, semantics and discourse features. It also explores the linguistic study of literature and deals with functional varieties, or registers, of English: the patterns of language as they vary across a range of different subcultures, in the way in which I have been using the term 'culture' today, and this includes of course the English of science, which I have been taking throughout these talks as the domain of learning to explore in greater detail. The programme also contributes to the effective **teaching** of the language—as itself, and as medium for teaching other things ('language across the curriculum', in educational parlance)—and, no less, as providing the foundation (1) for a greater general awareness of language, in the population at large, and (2) for research into any or all of the many aspects of language in which they have special expertise.

The other languages of Singapore are also important domains for linguistic study and research, and again, this means both the study of their grammar and phonology, their forms of discourse and so on, and the application of linguistics to the teaching and learning of these languages. The principles of applied linguistics are exactly the same whatever the language that is being taught; the way these principles are applied, in any one instance, depends of course on the particular circumstances—including which language it is that is being learnt, but it depends much more on the educational and broader social environment. Thus, there is a great deal to be gained from a conception of applied linguistics in relation to the teaching of all the Singapore languages; I do not see why there should not eventually be a joint effort in this field linking the learning and teaching of Chinese, Malay and Tamil to that of English.

All the points I have mentioned so far lie within the field of **educational** linguistics; let me now move beyond this to other areas where the study of language is involved. One field that I have not mentioned at all during these lectures is that of medical, or perhaps clinical linguistics, the linguistic investigation of language disorders of all kinds. The very general concept of aphasia, or language loss, is in fact simply a cover term for a great variety of different conditions; back in the 1920s, the great British aphasiologist Sir Henry Head, when he was asked how

many kinds of aphasia he was able to recognize, replied 'I have found as many different kinds of aphasia as the number of different patients I have examined'. Since then, of course, a great deal more had been learnt about these conditions; but there is a need now for extensive linguistic research and collaboration between language specialists and their medical colleagues, towards a deeper understanding of language disorders of all kinds, not only aphasias resulting from brain insults through injury or internal impairment but also language delay and disturbance in children, arising from congenital conditions such as autism or Down's syndrome. Such clinical applications of linguistics are likely to extend considerably within the next ten to twenty years.

Then, there is the field of linguistics and computer science. This collaboration has a long history (given the timescale of computers themselves): in 1956, I first began working in a machine translation project, and while in the years since that time, there have been some—what one might euphemistically call 'ups and downs' in computational linguistics (actually quite catastrophic shifts between exaggerated claims, on the one hand, and total disillusion on the other), by now the relationship is well established, at a number of different levels. These range from the processing of large quantities of linguistic data, which is simply using the computer as a tool for linguistic research, to truly collaborative work like that in artificial intelligence, that I referred to earlier. Text generation and parsing, while they are also from the linguists' point of view very useful strategies for investigating the properties of language—they enable us to test grammars (i.e. models of grammar), which are now far too complex to be tested in any other way—are forms of research which have numerous practical applications, including in the design of computers themselves: e.g. the particular nature of programming languages needs to be much more carefully researched using the methods of linguistic analysis. Computational linguistics could be another lively field of applied language research; again, not restricted to English—there is a great deal of activity in this area also in relation to Chinese. I am not talking here about the processing of Chinese characters, which does not need much contribution from linguistics, but about the much harder—and ultimately much more interesting—tasks of the production and decoding of discourse: that is, implementing a grammar of Chinese in a computer for the purpose of text generation and parsing. This of course is a necessary component of any programme in machine translation in which Chinese functions as source language or as target language.

And I personally hope that we shall see around the world increasing contact between linguists and natural scientists. It will have been clear from my topics throughout these lectures—and also from the general title that I gave to them—that I think this is emerging as an important research frontier for the future. I have tried to suggest that this is not assigning an undue priority to science, and the learning and teaching of science, over other domains within the University and in society; on the contrary, I think language provides the most hopeful context in which to break down the walls that still tend to surround the various disciplines. The physicists are, and have been for most of this century, engaged in redrawing our mental and physical map of the universe; but in the process they have been showing that the

universe has to be interpreted rather more in terms of communication, the exchange of information, than simply in terms of the cause-and-effect models of classical physics. And this not only unites a whole range of different disciplines, it also puts linguistics squarely in the centre of the picture. In a not too extravagantly metaphorical sense, the universe turns out to be made of language.

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