

***The Cognitive Psychology of
Literacy Teaching:
Reading, Writing, Spelling, Dyslexia,
& a bit besides.***

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Abstract

This ebook has gathered the nuts, bolts and practical implications of the cognitive psychology of literacy into one comprehensive and empowering volume. It also provides a much more thorough, teacher-friendly but properly sceptical scrutiny of dyslexia than you will find elsewhere. The book also reviews some interesting and unusual new ideas which are about to become a lot more mainstream: For example the powerful effect of affect on learning and performance, the ubiquity and significance of learned helplessness to learning and literacy and the deeply important, but as yet unrecognised, enigma of consciousness in our teaching.

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Introduction

Classroom practice should always have a firm and respectable intellectual basis.

(Waterland 1988 p. 10)

If we are to keep company for a while it behoves me to tell you something of my self, and of the genesis and purpose of this book. The books of this nature that I like best usually seem to me to have been written to answer their authors' own questions. Thus it is with this one. In it I answer the fundamental questions I had when I first began as a youthful volunteer, but I also ruminate about some of the more controversial ones I grapple with now, as a much greyer one.

I come from the world of adult literacy and inevitably show some bias in that direction. This does not mean that what I write applies only to adult literacy. Literacy is literacy at whatever age it is to be learned and there are thoughts and ideas for every teacher here. Indeed I believe you will find the journey both more human and more enlightening precisely because my bias shows.

The whole project arises from my own ignorance (steadily, if slowly, becoming less absolute) about *why*? Why do we use the methods we do? Why are there so many of them? Why are they so various? Whose idea are they anyway? Why do some feel good while others do not? Why do apparently contradictory methods often work equally well? Why do some succeed when others fail? Why is some stuff remembered but some forgotten? Why does some method engage and excite but some intimidate or repel? How do we read and why should we spell? Can there really be different styles of learning? Why do such passionate, even virulent, debates reverberate year on year in what ought to be a quiet backwater of science? Why don't we all agree, after all this time and after so much battle? Is resolution to be found and, if so, where? Can you really be specifically literacy-disabled - can you really be 'dyslexic'?

I started teaching literacy in the nineteen seventies, in what was uncompromisingly called *Adult Literacy*. I found, almost at once, that my profound ignorance of any of the theory behind literacy acquisition and performance was a very concrete handicap indeed. If I hadn't a clue, say, how spelling was actually managed in the mind (and indeed I had not) how could I tell what was or wasn't good method? How should I ever

develop? How might I progress from the oddly stultifying, sometimes bizarre and often frankly unsuccessful little collection of teaching ideas I had been given? When a method failed, why was that? How could I do better? What could I do differently, assuming I didn't want endlessly to repeat those lessons I had been given at my 'training'? What was success? How would I recognise it? Why was there so much failure? Why did students recall so little? Why was progress so slow? Why could students not perform in 'real life', as well as they seemed to in the classroom? (And see Abadzi 1994, Brooks *et al* 2001, Charnley & Jones 1981, Kambouri & Francis 1994, Sheehan-Holt & Smith 2000 for some further discussion of the effectiveness, or frequently ineffectiveness, of our tuition at that time.)

The original purpose of all this was simply to examine the concept of dyslexia appropriately. However, in order to do this properly, we need to understand a great many other ideas first. Hence the first three chapters of this essay. The other ideas we will look into en route are also fundamentally important to teaching and learning. This is why I make no apology for the distance we will travel before reaching our final goal - this and the fact that the route takes us over a lot of deeply interesting ground which is rewarding in itself.

I will lay my cards face up right from the start. My own experience, thinking and study and my own research have all convinced me that developmental dyslexia (at least as presently conceived) probably doesn't exist. I very, very, very much regret that this observation will instantly enrage some of you. Perhaps you will feel that I am denying that there are people who have unusual difficulty acquiring and using literacy. Perhaps you will feel that I am denying that such people need, and should have, extra and appropriate help. I can only say that neither of these is remotely true and respectfully ask that you read further before making your judgement.

If you can bring yourself to read this book with an open mind you will see why I think dyslexia may not exist and why, even although it is probably non-existent, I believe it causes such harm to its victims. I am not alone in my scepticism, either. A very substantial number, maybe even a quiet majority, of teachers of literacy privately doubt the reality of dyslexia. They must be silent, though. Most teachers are contracted to an educational institution. Dyslexia is recognised in UK law as a learning disability. All UK educational establishments are required to accept the reality of such disabilities, to screen for them and to have relevant remedial policies in place for dealing with them. None of their teaching staff is at liberty publicly to question dyslexia. Indeed they are required to do exactly the opposite. It's not a conspiracy, but it does bias the debate!

If we are to understand dyslexia, and how to consider it critically, fairly, honestly and

truthfully, we have first to understand the fundamental science underpinning literacy. (This is an absolute requirement which many writers do not satisfy.) This elementary foundation is what my early chapters are all about. They are about how the brain does it – how does it read, write or spell? I begin with the basic, essential cognitive psychology of literacy without which there can be no real understanding of it. I explore how this discipline, so fascinating in itself, also enriches our thinking and our practice. There is some jargon ahead (as there must be) but only, I promise you, what is absolutely necessary and I explain it all in plain language as we go along.

I appreciate that the very phrase ‘cognitive psychology’ is sufficient to cause many readers suddenly to decide to make a pizza, or a start on painting the bathroom, so I feel I must mount a deliberate defence of, and eulogy for, this marvellous subject. It goes like this:

Be not afraid of a little cognitive psychology! It is much simpler, more fascinating and more empowering, and much more elegant, than you may think. Your mind does a plethora of things, and it does them all the time - it is doing many things ‘you’ don’t know about right now. It is tracking your position in space and maintaining it; it is tracking your physiological status and maintaining that; it is tracking your immediate environment and what is taking place in it and will alert you immediately to any important change; as well as reading this sentence it may be simultaneously (but secretly) ruminating about all sorts of other stuff relating to other aspects of your life. Unless something urgent arises among all this you may never know anything of any of it.

Your mind is a fantastic device doing fantastic things, but it does almost all its work in secret obscurity. This is why we understand it so little and why we underestimate its profound quality so.

Cognitive psychology is a rather young science. It is the study of how your mind does all those complicated things we presently regard, in our ignorance, as simple - things like instantly recognising people, breeds of dog, makes of car or words on the page; understanding speech or text; speaking or writing; remembering shopping lists, birthdays, smells, melodies, the names of footballers, film stars or philosophers; walking and chewing gum at the same time; making pizza or painting the bathroom.

Whatever you do, your brain will have driven the process. No brain, no process. (The phrase ‘no brainer’ shows how we undervalue this superlative organ! Until you are dead, everything is precisely a brainer. The thing is everywhere and responsible for everything.) It must be admitted, though, that your mind is mysterious and obscure. It is

easily overlooked because its processes are almost always modestly unconscious. You neither notice these activities, nor, frankly, do you appreciate them. You just accept their discreet competence and magical reliability. You correspondingly seldom see all this as the *tour de force* it really is. I was about to say 'mind boggling *tour de force*' but of course your mind was not boggled at all. It almost never is.

Your mind is modest, but miraculous. It is constantly deluged, at high speed, with uncountable volumes of detail, some of which will prove important but much of which is either trivial or actually irrelevant. This flood of information has to be absorbed, filtered, analysed, considered, prioritised, mixed and matched or discarded before even the simplest perception or decision can be plucked from it. Your brain is literally fabulous. You do these unimaginably complex things all the time, without effort and without even noticing, never mind understanding how. This is truly magical. Cognitive psychology is magical too, though. It unpicks one sort of magic, that of awed ignorance, but replaces it with another, and better, magic, that of awed understanding. The awe remains.

How is cognitive psychology different from what we usually mean by 'psychology'? Cognitive psychology deals 'only' with the normal brain's everyday activities as it manages the everyday. It does not speculate about our relationship with mother, ask us to interpret ink blots, free associate or invoke ego, superego or id. Cognitive psychology is less and more than this. It is the study of the 'how does it do that?' question; the mechanics of mind. In our present context it deals with questions like: How do we read? Do we read letters or whole words? Do we read visually, or do we read sound? How do we recall spellings? How do we learn them in the first place? Do we use rules? What else could we use?

The processes of mind, though, are infuriatingly surreptitious. We can't see into mind, or talk to it. It is implacably inscrutable. Frustrated psychologists sometimes talk of it as a 'black box', as a result. Some fascinatingly cunning ways have been devised to reveal, or at least allow us to infer, its otherwise invisible procedures, nonetheless. Many of these experiments will have you smiling at their beautiful ingenuity. Cognitive psychology can reveal, has revealed and will continue to reveal the inspiringly elegant and practically empowering nuts and bolts of literacy management in our unbelievable minds.

This may need labouring in today's climate (and is why I am doing so here). There are people who abhor cognitive psychology and would wish to avert their gaze from it altogether. (Some of my best friends do this.) It is, they say, mechanistic and reductionist. "Where" they cry "is the real student in all this?"

I make the following reply:

First, it is a matter of level. We function on many different levels. They are not, though, mutually exclusive. We have personality, individuality, quirks and traits, beautiful (or ugly) thoughts, dreams, passions, principles, ideas and ideals and all the rest of it. We enjoy and we suffer. We love. Of course we do. However, on another level, all thought, learning, performance or understanding is, whether we like it or not, managed by a mechanism. Our marvellous minds exist only because of our brilliant brains. Our brain is a wonderful mechanism but it is still indisputably a mechanism. The most ethereal thought in your mind is also a particular pattern of connections, microvoltages and other ill-understood but vaguely chemical/electrical goings-on in the brain. How could it be otherwise? It is perfectly proper, therefore, indeed it is surely fascinating and inspiring, to consider the mind and brain at this level.

It would be as ridiculous, even irresponsible, to avoid the study of cognitive psychology when considering cognition - when examining literacy, for example - as it would be deliberately to ignore the mechanical truths of the motor car when maintaining one. Nor, of course, does an understanding of these mechanical truths detract from the appreciation of aesthetics. Understanding how a car functions may be demanding but it is a fundamental necessity if you wish to work on one. It is, though, much more than this - it also intensifies and amplifies your delight in the beauty of design and the cunning of function; increases your enjoyment of the motor car. So it is also with the mind. Cognitive psychology enhances respect for, and delight in, the mind and its miraculous abilities, heightens our aesthetic appreciation of mind and its astounding capacities.

Secondly, a basic understanding of the cognitive psychology which underlies literacy is profoundly enabling. It empowers and emancipates. It liberates us from blind dependency on all those pre-digested methods prescribed elsewhere, by someone else, for no one in particular. The motor mechanic who understands engineering will be a better and happier mechanic than he who does not. In exactly the same way, the teacher who understands something of cognitive psychology will see more clearly what is really going on, why and how. This happy teacher will be able to criticise constructively and to move forward independently, with the confidence of firm ground under the feet; will be able to build and adapt, evolve and grow.

Although cognitive psychology is so fascinating, and so fundamental to the understanding of literacy, there is beginning to be more mature debate as to exactly how sensible it is (or probably isn't) to separate it from the consideration of *affect* (emotions, moods, attitudes, motivations). The powerful influence of affect on cognitive

performance goes largely unrecognised and unexplored. The effects of affect on literacy are grossly under-estimated and under-researched. I therefore explore affect in this book, at least insofar as it affects literacy and the dyslexia issue. I believe it is soon going to be a much more prominent concern to educationalists of all stripes than it is now, both theoretically and practically. I believe it profoundly and importantly influences literacy acquisition and performance but that its negative effects can be mitigated and managed and positive affect can be deliberately stimulated and harnessed. I fumble towards a theoretical explanation of all this.

It may be helpful to consider the layout of the book and how it may be used. The first two chapters deal with the psychology we need to think about literacy in nitty-gritty, cognitive terms. They tell of the basic architecture of the brain and its basic operating procedures - fundamental processes with resounding names like spreading activation, association, top-down & bottom-up processing, cascading feature analysis. After the austerity of these two chapters, and based absolutely upon them, the book moves out into the world of practical literacy. Precisely because we have understood our cognitive psychology, we can begin to have some instructive fun as we consider our practice. We can root about among some of the most controversial ideas of the day and we can peer at possible futures. We will, finally, be in a position to take a properly informed and responsible look at dyslexia, the arguments around which involve so many different perspectives and demand such frank thinking.

Much of the book is taken up with chapter notes. This is intended to remove some of the drier, educationally relevant but, in this context, more peripheral, issues from the core text so that you may read on through the main narrative or plunge into greater detail or wider interest to suit time and taste.

I am confident about most of the material in my book, but some is more speculative. The first part of the book is about the basic cognitive psychology which matters to the literacy teacher. This is stuff around which there is consensus - it is mostly not controversial. It is entertaining, however, and can be very fruitful, to speculate about controversial topics and I go on to do some of this. These exploratory, and sometimes polemical and iconoclastic, adventures are intended to stimulate thought and promote curiosity.

For example, I repudiate the learning and applying of spelling rules; I take a few tentative steps into the upcoming and important debate around our conscious - the usefulness, or otherwise, of it or the unconscious to literacy; I seek to raise the profile of affect as a prime cause (as well as a prime complication) of literacy difficulties, especially apparently odd literacy difficulties; I denounce 'spellism' and urge us all to

relax rather than reform; I discuss attribution theory, maladaptive attributions and learned helplessness, which I believe powerfully affect both students and teachers, perhaps especially of literacy. Finally, I look long and sceptically at developmental dyslexia, a diagnosis of which I believe functions, in the real world, as a maladaptive attribution inducing learned helplessness in teacher and taught alike, despite dyslexia being itself unreal. I hope you will enjoy these arguments, and take something from them, even if you do not always accept my conclusions.

If I had to say in a single sentence what I felt this book was intended to do I would say that it is to stimulate thought, to bolster scepticism and to offer different viewpoints. I hope you will be able to develop some of the ideas in this book further than I have. These are exciting times and there is much to play for. I hope I have indicated where, and how, some of the games will be played and I hope this book awakens some interest in playing them yourself.

The reader will soon note that I usually refer to students, where I do, in the masculine. Most people I have taught have been. There is no gender-free substitute and I find 'he or she' tedious. I shall duck the issue altogether by claiming a convention. The reader will also note that I seem to have a particular someone in mind as I write. This virtual reader is ghostly and insubstantial, even to me, but she does at least have a gender. She is addressed, wherever she is addressed, in the feminine. This is not intended to infuriate anyone (of either gender) and will not, I hope, do so. I like to think there is nothing sinister behind this decision of my unconscious – perhaps it is because most teachers of literacy are, it seems to me delightfully, female. I continue, incidentally, to have a great deal of support and encouragement from many such people, a fact I should like loudly to record somewhere. This seems as good a place as any. I am very grateful indeed for it and to them.

Chapter One

Some basic neurology.

In which the reader considers both her brains, some neuro-anatomy, some fundamental processes of mind (such as association and spreading activation) and goes to Wimbledon.

It is a hard thing to have to admit, but when I was first introduced to adult literacy teaching the following quote applied, in spades. Literacy tuition provision for adults, in the 1970s and 1980s, was:

... a practically random pairing of complete strangers, frequently from very different social backgrounds, brought together to conduct an intimate and technically difficult transfer of skills often on the basis of little more than shared optimism. (Levine 1986 p. 95)

The little batch of new volunteer tutors, of which I was one, was given training: Twelve hours of practical tips and exhortations and a pile of cryptic handouts and strangely specific worksheets. We were then considered ready for student allocation and off we went, working, in those allegedly innocent days, in disconcerting seclusion, one to one, often in student's or tutor's homes. Nobody understood much about literacy or its acquisition, but nobody seemed particularly bothered either. The atmosphere was relentlessly optimistic, perhaps because there was so little assessment or understanding of our work. At the same time, though, it was felt that literacy was so complex as to be almost insuperable; a Byzantine labyrinth of incompletely understood, rule-based skills and sub-skills which were to be learned individually, overtly and in isolation from any other aspect of literacy, through endless performance of eccentric and often rather infantile exercises which were labour intensive for the tutor and repetitive for the student.

The meaning of much of what we did was difficult to discern. Perhaps because the transmission of real, autonomous, confidently useable literacy was felt to be unlikely the endeavour was sold to us mainly as a generally supportive, if patronising, social activity; as a Jolly Kind Thing To Do, and not much else. The technical outcomes of tuition were blurred and unregarded. Absurdities, often requiring scissors, coloured paper and glue, multiplied. It was the golden age for tutor autonomy and many and extraordinary were the things done in the name of literacy while it lasted.

We struggled on (and on and on), sometimes for years, the same tutors with the same students in much the same state, slowly toppling into the long grass by the wayside. We tutors, so obviously lacking 'a firm and respectable intellectual basis' (Waterland 1988 p. 10), were suckers for all those bizarre schemes and worksheets continually drilling such peculiarities as homographs or homophones, consonant blends or vowel digraphs, cloze exercises or phonological segmentation drills, continually seeking for succulent ways to present the same dry and tasteless thing. A singularly torpid pace, curiously forgettable material and an almost perverse inability to use anything apparently learned in class when out in the real world became accepted as inevitable and thus tolerable. Except, of course, that they are not.

We need the aforementioned 'firm and respectable intellectual base' beneath our feet if we are to pull ourselves free from such a condition. This intellectual base, in our present context, must include cognitive psychology - an understanding of the basic layout of, and procedures in, the brain, which is where it's all done. Without it we cannot understand literacy. I will therefore begin this book with a theoretical consideration of the cognitive psychology which enables reading and writing. This theory is beautiful, fascinating, exciting, eye-opening and liberating stuff, something to look forward to. It is the indispensable foundation of our 'intellectual base'. It is, for the thoughtful teacher, affirming and enabling. If you have read this far you already qualify as a thoughtful teacher. Perhaps, like me, you are convinced it can be better done and fascinated as to why it sometimes is and sometimes isn't.

In the words of one tutor 'Why does she spell 'people' correctly?' (Charnley and Jones 1981 p. 46). It's a fine question.

The home of literacy is in the mind, and our mind is constructed for us in, and by, our brain. To understand literacy, and dyslexia, therefore, we need to understand how the literate brain does such things. This is *cognitive psychology*; the study of how normal brains do normal things. It is a fascinating pursuit of deeply mysterious procedures. It is our last frontier. The brain is extraordinarily swift and extraordinarily efficient but it is a profoundly reticent organ. Its processes and procedures are held secret from us. It carries out almost all its work in the maddeningly clandestine unconscious.

Psychologists talk about the 'black box' paradigm. They mean by this that they see the brain as inscrutable; a black box we cannot open. Sometimes we are fairly certain more or less what information has gone into the box and, if we look intelligently enough, we can sometimes see reasonably accurately what comes out (a behaviour or decision perhaps). If we devise cunning experimental circumstances we can sometimes infer what processes probably took place in the box, but such inference is the closest we can presently get to a direct view. (*Priming* is a lovely example of such experimental

method, and see the notes to chapter three).

Inside the black box, of course, is our unconscious, a wonderful and infuriating mystery utterly hidden from our gaze. This is where cognitive psychology happens, and the things it can do are spectacular.

Consider Wimbledon. Our hero serves. His ball crosses the net at around 100 mph. We mortals call this sort of thing too fast to think about but, of course, that's exactly what our hero has to do, because a return is coming back almost as fast as his serve. Our boy has a number of quick decisions to make. These will be based on learned information and recent experience. He has intensively studied the behaviour of tennis balls on tennis rackets and on grass courts in many situations and conditions. He has learned how to move and control his own body on a tennis court. He has learned to see very particular things, and to analyse what he sees at high speed. He has learned much about his opponent during this and previous matches. He has planned and observed his own last service. He has also observed, with very experienced eyes, his opponent's body and racket address and movements, and those of the ball.

In the light of all this he has assessed the trajectory, speed, height and spin of the return ball and its likely behaviour if it hits the grass. He is, though, still following through from his service. He must manage his own immediate behaviour instantaneously and in several respects. He has to close his follow through movements appropriately and set in train another complex of movements covering his entire body and, very specifically, his racket arm. He must, of course, follow the ball intently with his eyes and mind, precisely and continually monitoring its behaviour, while doing all this.

At the same time, however, our boy must also be acutely aware of his opponent's behaviour. He studies and strategically analyses the body language displayed on the other side of the net. What does it tell him about the content of his opponent's mind, where and how he expects the ball to come back, what he expects to happen next and how he will deal with it when it does? Our boy will only finalise the striking of his ball once he has decided where it should best be placed, in view of all the foregoing, such as to cause his opponent maximum difficulty in retrieving it. And all this mental computation must continue apace immediately after the strike as a flexible position close to the net must be swiftly taken up just in case his opponent does scrape a return.

Our hero smoothly executes all this coordinated perception, analysis and action and successfully (I feel he will be champion this year) strikes the ball soundly beyond the possibility of return. While all this has been going on, though, he may also have been considering long-term strategy: is his opponent getting nervous? Is he poorer today at

baseline return than net play? Is his backhand particularly vulnerable today? Our hero may even have had time to wish that the overwrought but underdressed lady fan in the front row close to the service line and given to sudden screams of frenzied adoration, would go away and stay away.

And our hero has no idea whatsoever how any of this has been done. What mechanics, what wiring structures, what arrangement of brain cells and connections, what processes and procedures, could possibly have achieved all this stunning cognition so rapidly, efficiently and well and almost entirely without, apparently, involving 'him' at any stage – there having been no time for 'conscious thought'?

Literacy (at least as I practise it) certainly appears to be less spectacular than the above, but the reading, writing and spelling we all perform with such effortless speed and accuracy is not so much less remarkable in fact. These early chapters will consider our mental processes and procedures, and admire our mental capabilities, with literacy at the front of the mind, but first we must examine the amazing brain (or should that be brains?) in our head.

Our nervous system.

The basic layout of our nervous system is well known. Just about every part of our body is supplied with nerves. These either gather information for, or deliver instructions from, the brain at the top of the system. Inside the brain itself nerves connect copiously between different areas of it and pass impulses back and to within the brain. Nerve cells, or *neurons*, are what make up the system. A nerve cell has a body and from this body there arise numerous, and sometimes extremely long, protrusions. All nerve fibres, or nerves, are just such protrusions, or collections of such protrusions, of neuron cell bodies. It is these fibres which carry nervous impulses around the system. They are the system's wiring.

Nerve fibres within the brain usually end in connections with other neurons. These are very numerous. Every neuron in the brain makes hundreds, often thousands, of connections with other neurons in the brain. Every neuron in the brain receives hundreds, often thousands, of such connections from other neurons in the brain. The many connections each neuron makes or receives may be with, or from, neurons close by or far away across the brain.

Since there are perhaps ten billion neurons in the cerebral cortex, each making perhaps a couple of thousand connections with other neurons, you can see that some deeply elaborate, even rococo, circuitry can be built, and built in vast amount too. (Actually,

the number of neurons in your cerebral cortex, and the number of connections each may make, appear to vary according to the book you are reading at the time. I have just read a book telling me that there are a hundred billion neurons up there and that each may make ten thousand connections or more. Oh well ...!)

The point I am making is simply that, for practical purposes at any rate, your brain may be considered to be limitless in capacity. We should not be astonished by the man who speaks six languages; we should rather be surprised that we don't all do this. Einstein's brain (wherever it has got to) was very similar, physically, to yours or mine.

Some writers claim astounding things:

In the human cortex there is an awesome number of neurons, approximately ten billion. But the astonishing figure is the number of connections in the cortex, about one million billion. To count one of these connections each second would take thirty two million years. Even more stunning than the number of connections is the way the connections can be combined. The number of combinations that can be formed from the number of connections in the cortex is many times greater than the number of positively charged particles in the known universe, a number so great that we cannot give it a meaningful name.

(Greenfield 1995 pp. 83-84)

Not only are connections between neurons numerous (to put it mildly), they can also be *excitatory* or *inhibitory*. An excitatory connection makes it much easier for a stimulus to pass; an inhibitory connection makes it more difficult. In other words the system can make 'on', 'off' and 'dimmer' switch connections. The vast number of interconnections arising from, and impinging upon, every neuron in the brain and the fact that some of these are 'on', some 'off' and some variable 'dimmer' switches are two salient points about the wiring of the brain for our present purposes. Another is the staggering interconnectedness of the thing – everywhere seems to be connected to everywhere else, one way or another. Your brain is bogglingly enormous; an astoundingly massive organ. We were impressed by the pace, amount and quality of work it performed on the tennis court back there but we should no longer be flabbergasted. We have huge capacity and, because it is all so interconnected, we also have the ability to perform a multitude of tasks simultaneously. Indeed, we do this all the time, as a moment's reflection will show. With the hardware we have at our disposal this is easy enough.

Now we need a brief overview of the basic anatomy of the brain, some fundamental and applied neuroanatomy.

We can think of our brain as in four main functional parts: the *brainstem/midbrain complex*, the *forebrain*, the *cerebellum* and the *cerebral cortex*. (Damasio 2000 and England and Wakeley 1991). The brainstem/midbrain complex (and it is complex) comprises ancient, relatively primitive structures which need not, as they say, detain us long. Perhaps, when we understand better how this complex fits with, and perhaps intimately influences, the ‘higher’ structures of our brains this last remark will seem flippant but in our present state of knowledge, and for our present purposes, we can content ourselves with saying that the midbrain/brainstem complex is a complicated interconnecting and switching system which sorts incoming information from the body and outgoing instruction to the body. It monitors the body’s major systems and coordinates most unconscious activity. It keeps us alive and physiologically controlled but it doesn’t do any thinking, or have any fun. We will consider it no further in this book.

Immediately above this complex (depending a little, again, on who you read) the forebrain begins. There is a collection of anatomically and functionally distinct, but closely related, structures crouching deep within the brain which we are only just beginning to understand. These spooky structures make up the complex known as the *limbic system* in which I will include the basal ganglia, the caudate nucleus, the thalamus, the hippocampus, the amygdala and the putamen. They are each intimately and extensively associated with, and very copiously connected to, structures all over the ‘thinking’ cerebral cortex which wraps around them. They fundamentally, if as yet mysteriously, affect (perhaps even control) the activities in our cerebral cortex, at least in general terms. It’s scary stuff. They seem to be, among other things, the anatomical seat of our emotions and they have a profound influence on memory and recall.

They matter, in the context of literacy, as they may be the anatomical explanation for the profound influence that *affect* (emotion, mood, attitude) seems to have on the learning and performance of literacy. As a result of their extensive connections to the cerebral cortex they may be important to success or failure where these are mediated by affect, as they so often are. They are, therefore, implicated in the genesis of *learned helplessness*. They may also be important to, and may even control, the degree of arousal of the cortex and thus our motivation. These ancient structures have early access to information coming in from outside the brain, from sight and hearing for example but from other senses as well. In the light of this privileged knowledge they appear to mediate emotion and mood, appetites, drives and states of arousal across the entire cortex. They seem to oversee perception, especially perhaps emotional perception, and they seem to oversee general brain activity in response to these perceptions. All ‘higher’ cortical activity feeds back in some detail to these structures

which monitor and regulate this activity as a result. Indeed information constantly reverberates from our cortex to these structures (particularly to the thalamus) and back again to the cortex, so that we are perhaps taking second (or multiple?) looks at many things. It is even possible that the origin of that final mystery, our consciousness, is exactly this reverberation or amplification of cortical activity (and see notes to chapter six).

Things were neurologically simpler yesterday. Particular mental activities were, we thought, simply managed there, or there, or there. We imagined discrete areas of the brain doing discrete mental things in isolation, only needing to communicate with the rest of the brain in order to report in the results of their efforts. Today we increasingly recognise the more complex, holistic nature of the brain, the way in which everything seems to affect, or at the very least inform, everything else. We increasingly understand that many apparently barely related influences, particularly rather general, unconscious or emotional influences, bear on almost all mental activities, even apparently austere or intellectual, apparently conscious activities. We now realise that the intimate fingers of these 'lower' forebrain structures are to be found in mental pies all over the brain and at many different mental 'levels'.

We need to remember this when we talk about the cortex as if it were where everything 'intelligent' goes on – it probably isn't as simple as that. Conscious thought is probably largely the province of the cortex, but it is also probably heavily mediated, monitored and perhaps even actually controlled, by these 'lower' forebrain structures, especially the thalamus. There may be very specific mental organs all about the cortex but they probably don't function in such isolation as we used to imagine and they are probably very much more affected by other areas of the brain, higher or lower than themselves. Indeed, in chapter seven I will be suggesting that we still do not grasp the real extent of these influences and their resulting importance to the educational process.

In much the same vein, we have also to beware of our strongly over-simplifying, dualistic tendencies – our splitting of one function of the mind (consciousness, thought perhaps) from another (feeling, emotion, the body itself maybe). There is probably no such mind/body separation in the brain – there is probably only a mind/body whole (and, for some writers, there is only a mind/body/environment whole – eg Gibson 1986). We can, at any rate, readily see that we tend carelessly to elevate our conscious intellect to the status of all-powerful, central director of life, the universe and everything; the can-do mind to which all else is subordinate and from which all else is separate. We hugely exaggerate our conscious abilities thereby. Much more importantly for our educational purposes I believe, we shamefully underestimate our unconscious

ones. (In my notes to chapter six I discuss the enigma of consciousness - possibly deeply important to literacy teaching. I offer some tentative words on ecological psychology in the notes to this one.)

And finally, a peep at the cerebellum: this sits, looking a bit like a small cauliflower, tucked in behind and below our cerebral cortices. It has important functions in motor control, especially in the controlled performance of intensively-learned and automated movements like playing tennis, or the piano or driving the car. In our present state of knowledge the cerebellum is considered of minor importance to literacy, though it is very extensively linked with the 'thinking' cerebral cortex. This may have something to do with the apparently close involvement of motor memories, particularly pain, in some areas of 'higher' thought and perception. (Thelen 1995, Wall 1997 and notes to this chapter.) Some theorists (e.g. Nicholson and Fawcett 1999) also claim that *developmental dyslexia* is caused by inherited defects in the cerebellum. I examine dyslexia in critical depth in chapter eight and refer you to this discussion for a critique of this peculiar claim. I will otherwise not talk much more about the cerebellum in this book as I believe it is peripheral to our purpose. Time will tell, of course...

For the purposes of this essay on the cognitive psychology of literacy (and perhaps a little wrongly, as you can see), we are now going to concentrate upon the 'higher' levels of the forebrain, the *cerebral cortex*. Here we have Hercule Poirot's 'little grey cells'. Here, we still more or less believe, is the thinking equipment, the domain, probably, of the conscious, aware self – whatever that means. Here, we still believe, is the management of higher-level information, the sorting, combining and re-combining of ideas, consciously or otherwise. This is probably where 'we' live, intellectually at any rate; the place where all those debates as to who or what we are, whether God exists, what consciousness is all about, whether England will ever win the world cup again and where I last used the soldering iron actually go on. It is also where activities like literacy take place, at least in the main.

This unbelievable cerebral cortex is a two metre square sheet of nerve cells, about half a centimetre thick, folded up all over the surface of the brain. It is what you see when you look at a brain, therefore, as in figure 1.1.

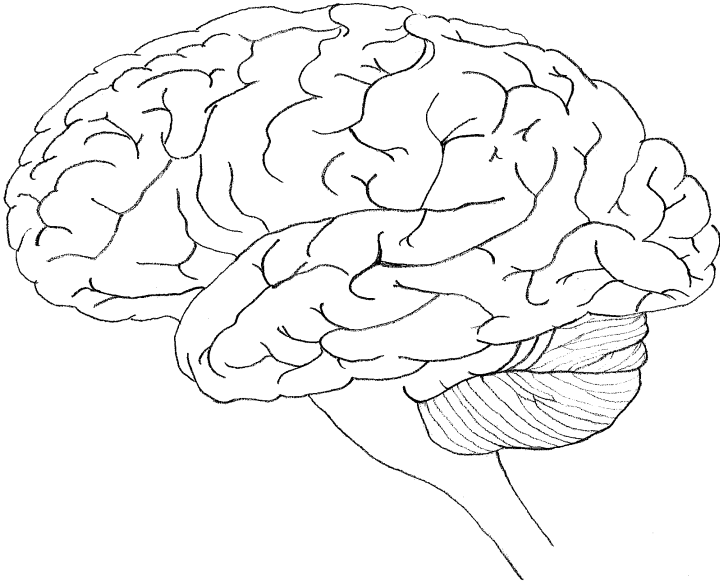


Figure 1.1 The left brain seen from the side.

Our Two Brains:

The cortex is split; it is in two halves, the right brain and the left brain. The disconcerting truth is that every one of us has not one but two brains. Even more disconcerting is the fact that these two brains are not just two halves of the same thing, or two replica brains or two mirror images of each other. Our two brains are quite separate individuals with different capacities and abilities – even different personalities. Your left and right brains have very different patterns of skills and see ‘reality’ from correspondingly different points of view. What one brain does well and easily the other may hardly be able to do at all. However, these two brains are joined together by a wide, thick band of millions of nerve fibres known as the *corpus callosum*.

Your brains communicate so swiftly, so completely and so intimately, via this corpus callosum, that you experience them as a single brain. Each of your brains is kept so instantly and fully informed as to what is going on in the other that we cannot tell them apart – under normal conditions. However, very serious epilepsy was, at one time in the USA, treated by surgically cutting the corpus callosum, thereby suddenly isolating the brains from each other. The effect on the severity of the epilepsy was only sometimes

improvement, but these 'split brain' patients were soon recognised as remarkable psychological subjects in which each brain might be accessed separately from the other, if the experimental or investigative method used were ingenious enough. Work with these patients has provided much of what we now know about our two different minds. (See also Springer and Deutsch 1997 and notes to this chapter.)

Somewhat simplistically, then, your left brain, your left cerebral hemisphere, is (almost always) the rather dry, logical, linear thinker. It is here that most nuts and bolts language management takes place, here that you mostly learn and deploy the skills of literacy. Your right brain (almost always) takes a more holistic view of the world, is more creative, perhaps, and a more lateral thinker. Your right brain is more 'into' the relationships between things than your left. Your right brain is probably better at hearing and enjoying the sounds of music or the beauties of art. It is as if you have two people in your skull neither of whom is a complete personality with a full complement of skills or characteristics.

You can think of them as 'Lee' and 'Roy'. Lee is a scientific thinker and articulate talker who is invariably logical and, at least on straightforward matters of fact, usually boringly correct. Roy, on the other hand, is unscientific but interesting; much 'cooler' than Lee. He digs his music, easily understands an engineering drawing and enjoys modern art, though he doesn't talk much about any of this. These two different personalities, however, communicate so constantly and completely that they have fooled you into seeing them as a single person - 'Leroy' perhaps. Lee may be a boffin, or yuppie, and Roy may be an artist and hippie, but Leroy is a full and balanced personality as a result of their alliance.

The only reason for discussing our two brains at all in this context is that it was once widely thought that literacy acquisition was related to brain and hand dominance. People talked about 'crossed laterality' or 'cerebral dominance', and still occasionally do. This was because we had discovered that the hand of one side is controlled by the brain of the other. (Your left hand is controlled by your right brain and vice versa.) Not only that, there is dominance; one cerebral hemisphere, usually your left, dominates the other and one hand, usually the right, dominates the other. Most of us are right handed, so we actually write with the hand which is controlled by the left hemisphere, where literacy is mainly dealt with. A left hander, though, is writing with the hand which is under the control of the less literate brain, and the non-dominant brain to boot. It was thought that this must result in literacy difficulties – i.e. that left-handers would be more at risk of, say, dyslexia.

None of this is regarded as true today. None of this, we now think, has anything

whatsoever to do with literacy acquisition or performance, let alone dyslexia. Hemispheric dominance is irrelevant to our study, and so is handedness. I offer the discussion here merely as an item of historical interest and because you may come across references to crossed laterality or cerebral or hand dominance issues in odd or elderly corners of the literature. You may ignore these if you do.

We shall shortly be attributing different aspects of literacy and language learning and management to rather highly specified areas of the brain. This may be slightly simplistic, as I have already confessed, but if we keep our provisos in mind it will still amount to a reasonably true and practically useable account. In order to make sure that we really do bear this oversimplification in mind, and proceed sufficiently humbly, let us remember phrenology. A little over 100 years ago phrenologists claimed that there were different 'organs' within the brain and that these could be felt as a series of bumps on the skull. They claimed there were, for example, organs of cautiousness, destructiveness, constructiveness, acquisitiveness, congeniality and (my favourite) mirthfulness. After comprehensively feeling all the bumps on your skull a phrenologist would attribute characteristics and abilities to the mental organs beneath the bumps, and claim to understand your particular personality from the size of your bumps. This was a charming theory, but wrong of course.

Today we are more empirical and the phrenologist's organs have been replaced by Brodmann's areas (e.g. England and Wakeley 1991). We scan, observe and experiment and we claim (and hope) that our theories are based on rigorous and empirical, neurological evidence. For humility's sake, though, I keep a facsimile phrenologist's head right here on my desk. It keeps me sceptical, as is scientifically proper.

Some of our most solid neuropsychological evidence comes from post mortem examinations, when clinical symptoms observed during life can be correlated with lesions in the brain found after death. (The first demonstrations of consistent and particular loss of function following damage to particular areas of the brain were language disorders in fact, namely Broca's and Wernicke's aphasias. Hence Broca's and Wernicke's areas.) Today we can, of course, X-ray and scan the living brain. We can visualise areas of activity and inactivity and we can visualise abnormalities such as lesions or tumours.

Scans are very tempting. They tempt us to imagine we can directly see brain processes. Scanners provide such dramatic and colourful pictures and cost such impressive amounts of money. Their evidence must be taken with at least a pinch of salt, nonetheless. They show clinical lesions and abnormalities extraordinarily well, but revealing physical structure is very different to demonstrating brain processes. A scan is

still far too blunt an instrument with which to study the processes of such a fabulously subtle, complex (and still so little understood) organ. We cannot photograph, for example, love, or literacy. Way too much is often claimed for those gorgeous and satisfyingly high tech. and pricey pictures.

Away from the clinical arena, cognitive psychologists experiment and observe. Cleverly devised experiments manipulate circumstances and input. Output is observed and cunningly interpreted. Inferences are made as to the processes which must have been taking place inside the impenetrable black box if such and such an input produced such and such an output in such and such a circumstance. (Priming is an entertaining example of exactly such experimentation and is discussed in notes to chapter three.) We can also, though, simply observe the mind in action and make inferences from its behaviour. Errors of speech, for example, can reveal process. We might say 'This writing is borer' for 'This writer is boring'. The 'ing' and 'er' have been switched. They are both *morphemes*. (A morpheme is the smallest meaningful unit of language – in this example 'ing' and 'er' are morphemes, as are 'write' and 'bore'.)

We usually make this kind of error (a Spoonerism), when we do, with entire morphemes, not with smaller units. The smallest unit we switch is normally a whole morpheme. This tells us that we probably store morphemes separately in our heads as whole morphemes (in this instance that 'ing' and 'er' are held separate from 'write' and 'bore'), and that we retrieve them separately and first put them together (concatenate them) at a fairly late stage of speech assembly. (I told you cognitive psychology was fun. Much more charm than phrenology. And where else will you get the chance to use words like concatenate?)

Much of what I am about to say is anatomically true, so far as it goes, but is also probably a little simplistic, as already admitted. We should remember that the activities of the cerebral cortex, literacy included, are affected, probably very powerfully, by limbic system and thalamus, in ways which are unclear as yet. We need also to remember that most of our cortex is uncommitted *association cortex*, rather than being innately pre-programmed to do something specific. That is, most of our cortex is general, uncommitted ability looking for something – anything – to learn. We can learn Urdu or Mandarin Chinese, IT skills or macramé, scuba diving or car maintenance, the history of Egypt or flower arranging (and, of course, we can learn all of these and more – the sky appears to be the limit). In other words very little of our cortex is earmarked in advance for anything in particular; instead, it is eager to cope with just about anything that turns up. We are omnivorous, practically limitless learners of whatever does.

Microstructure and Wiring: (How's it done?)

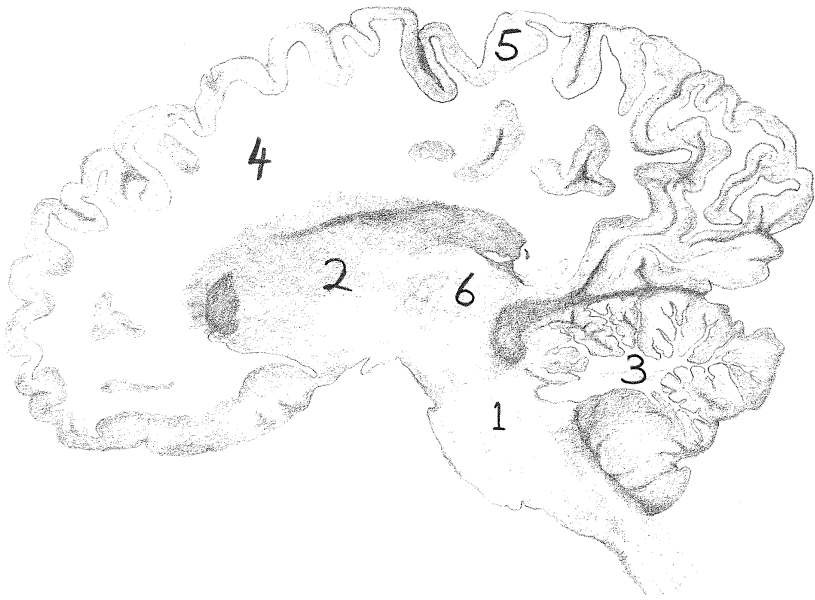


Figure 1.2. A cross section of the brain.

1 = brain stem, 2 = corpus callosum, 3 = cerebellum, 4 = white matter, 5 = grey matter, 6 = thalamus

If you examine the cerebral cortex you find it is in two areas. Inside the cortex is a white area, the *white matter*, wrapped around those central structures such as the limbic system and thalamus (and see figure 1.2). This white matter is simply billions of nerve fibres criss-crossing the system, connecting everything to everything else as we have already seen. On the outer edge of the cortex, though, is a grey zone, the *grey matter*, made up of neuron cell bodies, the 'little grey cells'. If you placed a section of this grey matter under a microscope you would see that it is a layer about 110 cells thick, on average. You would see that these cells tend to be arranged in *columns*. Each column is thus an arrangement of about 110 cells in a line and it is thought that it probably functions as a unit which analyses a single detail of information. Each column of cells, perhaps, 'thinks about' – processes information about – a single detail. These columns of cells seem themselves to be arranged into microscopic *modules*, each module comprising many columns and each responsible, perhaps, for processing related information - thinking about a single subject.

Let us use voice recognition as an example. We recognise people by voice alone, so there must be a 'voice bank' in there somewhere. Perhaps it is a module. Perhaps each column of cells in this module is responsible for monitoring incoming voices over a narrow range of frequencies, and a module of several such columns, each dealing with slightly different frequency ranges, will be able to 'read out' the frequency distributions of any voice heard. This could be said to be our phase one voice bank, our voice recognition phase one.

Remember, though, that every neuron may make thousands of connections with, and receive thousands of connections from, other cells, in other columns, nearby or far away. Some will connect with closely related columns in modules dealing with closely related information, but others will connect with distantly related columns in modules dealing with distantly related information or ideas. Remember, also, that some are excitatory 'on switch' connections while others are inhibitory 'off switch' connections. Remember also that I have only completed phase one of my voice recognition. I have a read-out of the frequencies, but no real-world meaning for this data. The frequency pattern data recognised in my voice bank in phase one must be interpreted, given meaning against the real world, in another *association area* - an area in which I may associate voice read-out data with personal ID. Here, I may associate (cross-reference) the frequency characteristics of voices with the identity of persons - I may recognise actual people by voice, in short.

Exciting the neurons relating to a particular person in this area will, of course, tend to send impulses racing away down the neuron cell protrusions from their ID module and some of these will excite appropriate cells in the areas where physical data about people is held, and so a mental picture of the person may also be formed. Neuron connections will also, and inevitably, spread activation to areas where all the other data about the person is managed - their place in my life, the world and so on. And so on. And so on. (And see a discussion of pattern associators in the notes to chapter two.)

Supposing, then, that I know that my Danish wife and our son are both home and a voice calls to me. My voice recognition modules burst into action. They detect a characteristic pattern of higher frequencies and Danish intonations. These patterns will tend to excite the distant but related 'wife identification' modules but tend also to inhibit those for 'son recognition'. I will be some way towards the correct identification of my wife's call, and my wife herself as a result, even before my voice bank has fully analysed the sound. The excitation of 'wife ID' modules will tend to excite even very distantly related modules, for example those related to shopping - we are to do the weekly shopping today - and these modules will tend to excite those in which (I hope) I

presently hold the information as to what I think we need to buy, what I need to wear and where the keys are. All this (it is time to go) is tending to inhibit activity in those modules presently engaged in locating and organising ideas about cognition, and dressing them in respectable language.

This has been our first glimpse of the absolutely fundamental mental process of *spreading activation* whereby any brain activity tends to reverberate around all sorts of perhaps only vaguely related subject areas in the mind. We can begin to see how this process, especially if on/off and dimmer switching possibilities are built into the system, enables decisions to be reached very fast and their implications spread and considered very rapidly. These decisions may involve many different aspects of the same issue simultaneously (remember our tennis player). Spreading activation not only enables rapid decision-making but also enriches information by involving all the different facets of it which we have in our heads. This combining and re-combining of information within the mind is *association*.

It is thought that about 95% of the activity in the cerebral cortex at any time is pure association within it, only about 5% being either the intake of new information to the brain or the delivery of instructions from it. This association can be thought of as what, today, would be called 'information processing'. (Though see a fascinating chapter by Frank Smith in Olson et al (1985) debating whether what we have in our heads should properly be called 'information' at all. You may also wish to read about ecological psychology. This now-you-see-it-now-you-don't approach begins with Gibson (1986) and is briefly discussed in my notes to this chapter).

Summary to date:

We have taken a preliminary look at the brain – its structures and its processes. What we have seen is an organ of colossal potential in which specific tasks are managed in specific areas but in which everywhere informs and is informed by everywhere else. We saw that we have two distinct brains but that these communicate totally and continuously across the corpus callosum. We saw the limbic system curled up at the centre of the brain and we saw that these structures also communicate intimately and continually with the 'higher' cortex. The limbic system mediates, monitors and to some extent at least controls some of the activities of the cortex which we used to regard as purely, indeed loftily, intellectual.

It's not quite this simple and the cortex is neither as distinct nor as authoritative as we would like to believe. Nor, of course, is our consciousness. The limbic system also

mediates general states, such as emotional status and mental arousal, and is involved in issues such as memory and recall. We dismissed phrenology and crossed laterality but embraced humility and scepticism, and we considered two very basic brain processes, association and spreading activation. We observed, as a result, that the brain is a flexible, omnivorous learner with a capacity which we may consider to be limitless for practical purposes. Having laid these foundations we are now ready to consider the brain's behaviours; how it may manage language in its various forms and literacy in particular.

Chapter two

Language management.

In which the reader examines the management of language within her cerebral cortex and meets mental lexicons there; is introduced to top-down and bottom-up processing, cascading feature analysis and parallel distributed processing. She also goes to a party and considers a dog.

We will be discussing the nitty-gritty of language management and its implications for literacy a little later. Finally, we will find ourselves at an elderly, but still fundamental, controversy which we can then fruitfully examine in the light of the above. We start, though, with a little fundamental neuroanatomy and neuro-psychology. Where, and how, do procedures relevant to literacy actually happen in the brain?

Our cerebral cortices, one left cortex and one right cortex, where we think most of our 'thinking' goes on, are very swift and have huge capacity. The details of their procedures, however, remain imperfectly understood, to say the least. All the same, we know that certain fairly specific areas of our brain are involved in certain fairly specific functions of our minds. We know, for example, that most people manage language pretty well exclusively in the left brain, and we know roughly where we do this. The basic neuroanatomy of language management in the left brain is pictured at figure 2.1 in outline and is immediately explained in the text.

Later on, and bit by bit, this anatomical mapping will be lined up with logical and empirical cognitive mapping of literacy management. Anatomy will be shown to fit logical deduction and empirical findings. (The complete proposed map of language management is at appendix one if you need an early peep.) As a result of this marriage of observation with logic we will be able to see how and where those literacy procedures we reliably observe or infer, from real life and from experiments, probably happen in real brains. We need to understand all this if we are to consider the issues still being fought over as to how we really manage literacy and so how best we should present it for learning.

It is important that we bear in mind that what follows is simplified. It is, nonetheless, close enough to the probable truth to enable valid and valuable insights into literacy to be found and evidence-based, practically and pedagogically useful conclusions to be reached.

Mental lexicons.

Imagine you are chatting with someone. Using the outline of language management centres and pathways at figure 2.1 below, let us consider how you might be translating the noises your companion is making into meaning inside your head. You will necessarily have to consult a language store, or lexicon, of some kind to do this. You will have to consult a *mental lexicon*, so there must be one in your head. Mental lexicons will reappear when we examine routes to reading and routes to spelling. But where is meaning and what is it? What is a mental lexicon? What will it contain? How might it work? Is one lexicon enough?

A *lexicon* is a store of language. One form of mental lexicon might be a dictionary of word meanings in your head, but what other forms might a lexicon take? Is there just one, with every word you know filed under its meaning, perhaps in sections of related meanings or with a quick-find system of extensive cross-referencing by meaning? You certainly have a large vocabulary with a huge number of entries and an extraordinarily rapid access system. You probably have entries for somewhere in the region of 50,000 (that's fifty thousand) items, and you can reach any one of these entries in less than a second (Aitchison 1987). And, of course, you may be able to match this several times over, in different languages. (Remember how colossal your brain is and enjoy it!)

But there is more. We deal with language in several other, and completely different, manifestations. We hear it as *sound*. We see language as *symbols*, as you are doing now. We understand language as *abstract meaning* (unrelated to sound or symbol). We also manage it as sets of detailed *motor instructions to muscles* (the muscles dedicated to producing speech or writing). It follows that we must have sites in the brain where all these utterly different incarnations of language are stored and where they can be accessed for the purposes of recognition (reading or understanding speech) or execution (talking, writing or thinking). These sites are also mental lexicons.

At a minimum we must have at least one *semantic lexicon* where we hold language-as-meaning. We must have at least one *auditory lexicon* where we hold language-as-sounds. We must have at least one *visual lexicon* where we hold language-as-visual symbols. And you may be fluent and literate in different languages with different scripts. If so, you have a separate set of replica lexicons for each language. (As before, I am tempted to write that the mind boggles except that, as we have already seen, it doesn't even come close to boggling.) Let us consider language management, and the procedures which this management of language entails, in a little detail. Later we will consider the significance of all of this essential neuro-stuff to the teaching and managing of literacy (see chapter three).

Understanding speech: From sound to meaning.



Figure 2.1 Language management in the left brain.

Beginning, then, with speech; with language-as-sounds coming in from the ears and reaching area 1 on figure 2.1. Area 1 is the *auditory association area* - the area which receives the sounds of speech from the ears, and then makes appropriate *associations* among them, the area which recognises spoken language as spoken language. (Areas 1 and 2 are also called *Wernicke's area* after he who first surmised their function in the late 19th century.) In this auditory association area incoming noises are analysed until recognised as the constituent sounds of speech. (This is not, incidentally, a simple matter! Speech is usually extraordinarily indistinct, messy stuff – sounds are often swallowed and lost, or blended into other sounds, word boundaries regularly disappear. Language is enthusiastically mangled when we speak.)

However, our auditory association area nonetheless somehow contrives to recognise (or even reconstruct for us) its constituent sounds, or *phonemes*. (A phoneme is the

smallest distinct linguistic sound (smaller, usually, than a syllable) - 'ea' and 't' in 'eat', for example; 't', 'ea' and 'ch' in 'teach' or 'c' 'a' and 't' in 'cat'.) This raw material, this collection of phonemes, is then passed on to area 2 on figure 2.1. This is the *speech association area*. Here, the phonemes are assembled into mental representations of language, but only of language-as-sounds. At this point spoken language has been recognised but is represented purely by its sounds. It is a collection of phonemes represented in what we can call *phonemic code*. It is in a mental lexicon where language coming in from the ears is held in phonemic code, and this area can therefore be called an *auditory input lexicon*.

The sounds have been heard and recognised as speech - as language-as-sounds. We still have no meaning, at this point, however - we have not yet understood the speech. The phonemically coded bits and pieces of language-as-sounds must be sent further, to area 5 on figure 2.1, which is the *language association area*. This is where language-as-meaning is stored; it is the site of the *semantic lexicon*. In it the phonemically coded units of language-as-sounds access and activate their counterparts representing language-as-meaning, as semantic units. At this point the language has been translated from language-as-sound in phonemic code into language-as-meaning - into *semantic code*. When the semantically coded representation of the language we heard has been thus activated we can say that the speech has been understood, we have reached meaning from noise.

(Philosophy intrudes at this point; have we really reached any meaning without further associating the bald dictionary meanings of the speech with the real world? Unless I somehow associate the words I have just heard ('don't forget your dental appointment!') with my life they still remain meaningless, philosophically speaking. Let us leave it right there for the time being, however, and push on with cognition.)

Another small diversion: You may already be becoming a serious cognitive psychologist and wondering how speech (and, for that matter, handwriting) can be decoded and understood so accurately and easily if they are such degraded, distorted, messy and mangled signals? How do we deal with such blurred and patchy material? How do we 'hear', perfectly clearly, 'the cat sat on the mat' when what was actually said was 'ca' sa' [mumble] ma'? How does anyone manage to read handwriting, especially mine? This is a practically and theoretically important question and one elegant and plausible answer is the *pattern associator network*.

A pattern associator network is a small network of interconnected neurons, a *neural net*, enabling one mental representation to be translated correctly into another - phonemically coded language into semantically coded language, for example, or the

picture of a rose into a memory of its scent. A pattern associator network is a plausible neuroanatomical explanation of how this may be done even when the first representation is incomplete or seriously degraded. (See notes to this chapter and Rumelhart and McClelland 1986 vol. 1 pp. 33-37.)

Understanding text: From symbol to meaning.

The neuropsychology (for such it is) of reading to meaning is much the same, in principle. Language is presented to us as text; as a collection of visual symbols or *graphemes*. You are looking at a mass of graphemes right now, and making meaning from them. (A grapheme is the smallest meaningful visual representation of language. It is usually a letter, of course, but might also be a sign, or even a logo (+ or - for example, also £, \$, %, &, @, ♪, ♂, ♀ etc.). The eyes pass the information, the detail of all those squiggles on the page, to the visual cortex, actually at the very back of the brain, to the *visual association area* which is at area 3 on figure 2.1. Here the initial analysis into mental representations of symbolic language - language-as-symbol - begins. Text is recognised as linguistic symbols and this information is then passed to the *symbol association area* which is at area 4 on figure 2.1. Here, the symbols are associated and recognised as units of language-as-symbol. This incoming language is being represented purely as symbols, as graphemes, and is, perforce, in *graphemic code*.

At this moment it is only a collection of graphemes represented in graphemic code. It is graphemically coded language coming in from the eyes and presently held in a mental lexicon we can call the *visual input lexicon*.

(As yet we do not know whether this representation is usually of letters, letter patterns, whole words or even whole phrases. Indeed, it is likely that the answer is different in different circumstances. Except when text is difficult or words are very new we probably 'read' much larger units than letters - whole words or at least morphemes. You read the words 'except when text is difficult' much easier, and perhaps differently, than you did the names 'Rumelhart and McClelland'. This opens an interesting and often very warm debate, of which more later. Cognitive psychology has real answers.)

However, getting back to our graphemically coded language: Just as before, we still have no meaning for this language-as-symbols; we only have linguistic symbols in graphemic code in the visual input lexicon. To reach meaning we must again pass this data further - from that lexicon to the semantic lexicon. Each graphemically coded item of language must access its semantically coded equivalent in the semantic lexicon, at which point language-as-symbol (graphemically coded language) has activated language-as-meaning

(semantically coded language) and we can say that the text has been understood and we have read to meaning. (With the same philosophical proviso as previously noted, of course - unless I appropriately associate the semantically coded language I have just read ('low battery: You should immediately change your battery or switch to outlet power ...') with my real life it still has no genuine meaning, I suppose.)

Let us consider one more diversion from our main argument, a taster for chapter three's discussion, and a brief glance at the ancient, but still fulminating, controversy of whether we read (or spell) primarily by visual or phonic attack. Let us loudly and clearly note that the route to reading we have just examined (visual association from graphemes straight to meaning) is the *direct* route; it is the most economical and the quickest route to reading. It is sometimes referred to as the *lexical* route. (Ellis 1993, Taft 1991)

Let us note that this route made no reference to sound whatsoever (though spreading activation may well reverberate further and reach it). The text reached meaning directly from visual representation of language-as-symbol (graphemically coded language) to language-as-meaning (semantically coded language). It went directly from page to eye to visual input lexicon to semantic lexicon (and see chapter three and appendix one). It was pure visual attack and sound was not necessary to it.

We normally read visually. What, though, if the text is difficult and full of unknown words like lysosome, or apocope? An alternative, though slower, clunkier and more expensive, route enables us to read by sound. It takes text first to graphemic code in the visual input lexicon, as it must, but then to a *conversion link* (a translation service, in effect, translating graphemic code into phonemic code) then, in phonemic code, to the auditory input lexicon and only then to meaning in the semantic lexicon (see figure 3.3 in chapter 3). In other words, decoding text to graphemes, translating these representations into representations of sounds and using these representations of sounds to reach meaning. This more roundabout route, sometimes called the *sublexical* route, delivers what is called *assembled* reading.

Being less economical, and less elegant, we can assert that assembled reading is inherently much less likely to be the way reading is primarily done in fact, under usual circumstances and assuming a fluent reader. (Biology is ruthlessly economical, and elegant, at all times.) This sublexical route, from text to sound to meaning, is also clearly not necessary except for words which are complex, or new to the reader, and must be 'sounded out' ('sublexical' perhaps, or 'phonological').

A mass of evidence exists to show that readers do it visually as a primary strategy and

phonically only secondarily or as a 'useful second pass' (e.g. in Adams 1990, Ellis 1993, Ellis and Young 1996, Taft 1991, Rayner and Pollatsek 1989) or as part of the probably flexibly applied *dual-route* strategy - read primarily visually when text is familiar, but also more phonically when extra support is necessary. (Adams 1990, Coltheart *et al* 1993, Decker *et al* 2003, Goswami and Bryant 1990, Rayner and Pollatsek 1991, Smith 2004, Stanovich 2000, Underwood and Batt 1986 and Wray 1994.)

Notwithstanding the evidence, and the logic, there continues to be hot, sometimes virulent, argument, at chalkfaces, in the media and in government departments. We will more thoroughly examine this controversy (the 'reading wars') in the next chapter.

We have known for over a century that mental lexicons are anatomically distinct. We know (and it is logically demanded) that in each lexicon language is represented as single code; that in the visual lexicon there is only language in graphemic code and that in the auditory lexicon there is only language in phonemic code, for example. (Ellis 1993, Ellis and Beattie 1986, Ellis and Young 1996, Taft 1991) It has been shown that the routes are distinct, too. (Morton and Gipson, both cited in Ellis 1984 and see Ellis 1993, Ellis and Beattie 1986, Ellis and Young 1996, Taft 1991 and later in this book)

The routes we have discussed to date are direct, or lexical, routes, managing language in only a single manifestation corresponding to the sense through which it has been appreciated. All other routes are less direct, more clunky, more expensive and deliver assembled, rather than directly accessed, meaning, of which more in chapter three.

Speaking and writing: from meaning to sound or symbol.

What about when we produce language, either as sound (speech) or text (writing)? To do these we first have to activate semantic meaning in our semantic lexicon, to activate mental representations of meaning in the form of language. To come up with something to say, in semantic code. (Philosophy intrudes again: 'who' activates this meaning? From where does the original impulse to access these words come? How could any of this start? My only defence to this is to look shifty and move on.) Let us quickly, if timidly, abandon philosophy and take the cognitive story up from the point at which 'I' have, in fact, thought of some meaning and decided either to put it in writing or utter it as speech. 'I' have somehow begun activating entries in my semantic lexicon and am ready to go.

These activated representations of language-as-meaning, language in semantic code, will be passed to the appropriate motor areas of the brain (areas to do with formulating commands, usually to muscle groups). These semantically coded representations will

there be associated with their motor coded counterparts, which are instructions to the relevant muscle groups for appropriate action. For example, data relating to the language I wish to write will be passed to area 7 on figure 2.1. This area is the hand motor area. Here, instructions are formulated and issued which will cause my hand to move in such a way that I write my meaning down. The semantically coded language-as-meaning is translated into motor coded language-as-hand-movements and I write my meaning. Should I wish to speak my meaning I must send the data, the semantically coded language-as-meaning, from the semantic lexicon at area 5 to Broca's area at area 6. There, appropriate instructions to the muscle groups responsible for the production of speech will be produced and distributed; the semantically coded language will be translated into motor coded language-as-speech-movements and I will speak my words.

To write, I activate language-as-meaning, in semantic code, translate it in the hand motor area into instructions to the groups of muscles which write, and write my meaning into symbol. To speak, I activate language-as-meaning, in semantic code, translate it in Broca's area into directions to the groups of muscles which enable me to speak, and speak my meaning as sound.

To reiterate a point made earlier about reading to meaning, which applies similarly to writing our meaning: The procedures I have described which enabled me to write my meaning made no reference to sound. I took semantically coded language directly to the hand motor area and that area delivered motor instructions to my hand. I was not required to activate phonemically coded language at any point. This is the most direct route from meaning to writing. It is a direct, or lexical, route. This direct route is obviously the cheapest and simplest way to writing from meaning and is therefore much the most likely candidate for the way we do this, in usual circumstances.

My activation of semantically coded language may reverberate as far as sound in my brain, it may also activate phonemically coded language in there and I may 'hear' what I write as I write it, but this auditory activation is not necessary for me to write (in usual circumstances and with simple or well-known language). This auditory activation is secondary to most writing. Perhaps, for example, I write easy language such as 'I will speak my words' using direct, lexical activation but may consult sound when I attempt 'activation of semantically coded language'? Perhaps we flexibly deploy a dual-route strategy? Such thinking will be germane to our discussion of the whole language vs. phonics controversy, the 'reading wars' in chapter three.

To summarise the first two chapters thus far:

We have glanced at the wiring - how the cerebral cortex is probably structured in that regard and how it probably works. We noted that particular activities tend to be performed in specific areas of the cortex and we have mapped some of these. We have discussed, in some detail, the basic neuroanatomy of language management in the left cerebral cortex. We have examined the various mental lexicons which correspond to the various logically deduced manifestations of language. We have suggested that analysis of information takes place in columns of cells arranged into modules by function. We noted that a truly stupendous amount of interconnection between modules is built in to the system, giving it the potential for almost unlimited capabilities. We saw that these connections between neurons can be weakly or strongly excitatory or inhibitory. We have not yet said so aloud, but learning is presumably the establishment of particular associations and we imagine it must be the result of the establishment of particular connections and patterns of connections among neurons and the tiny modules they make up. Mental connections and patterns must in some way correspond to physical connections and patterns (and see notes to this chapter).

We are now in a position to consider four very basic psychological concepts: *spreading activation* and *cascading analysis* together with *top-down* and *bottom-up* processing. We will then be able to see how these might impinge on the management and learning of literacy by real brains in the real world.

Spreading activation.

To begin with *spreading activation*. This is a simple, and objectively obvious, feature of the wiring of the little grey cells. Drop any idea into your head (say 'holidays' for example) and quite a large number of related ideas will become activated in response. Not all will be so strongly activated as to reach your conscious awareness, but all ideas even remotely related to (wired to) the original idea will have received at least some activation.

You have probably found yourself purposefully exploiting this feature of your brain when trying to remember something specific but which you can't recall right now. Often the best way to do this is deliberately to think of something you know it is related to, maybe what you were doing around the same time, perhaps something about the location or people with which you know it is associated. One thing, as they say, leads to another. What you wanted was, as you knew it would be, activated by your deliberate

activation of a related item and thereby itself made more easily accessed. You deliberately set spreading activation off, in the knowledge that somewhere in its net was the item you sought but could not access directly.

Spreading activation is, incidentally, not usually a thing we can choose to do or not to do; it just happens. Activating one cell, or module, automatically sends stimulation (positive or negative) away off down its myriad processes to all the cells or modules to which it is connected (and often onward from these to even more distantly related cells or modules). Spreading activation is, in psychojargon, *mandatory*.

Spreading activation is, of course, responsible for another important and objectively obvious aspect of our brain's behaviour - its ability to do lots of different things all at the same time. Spreading activation spreads activation; that is, it sets off other foci of activity in many places other than the one originally excited. Before long, all sorts of stuff is going on all over the place, mostly unconsciously but still going on - being dealt with. Your brain works, in fact, in a *parallel, distributed* way. It processes many different kinds of material, in many different places, at the same time. It does almost all of this absolutely unconsciously, though.

Your conscious is embarrassingly small, like a single, not particularly wonderful computer, and is able to process only one item at a time, serially and ponderously (and see notes to chapter six). Your unconscious, in strong contrast, is like a plethora of computers spread all over the brain and all potentially active all the time; able to work on related or unrelated matters and communicating with each other about their conclusions as appropriate with no direction from 'us' at all and without necessarily informing 'us' about any of it. (Our tennis star from chapter one did it unconsciously. There was nothing like enough time for conscious thought.)

This is the colossal power of parallel distributed processing, or *PDP* (Rumelhart and McClelland 1986 and McClelland and Rumelhart 1986). Grand slam tennis, and literacy, are simple tricks to an apparatus so large and so massively interconnected.

Top-down and bottom-up processing.

Bottom-up processing is the somewhat simplistic idea that your brain makes up its mind as to what is going on based solely on evidence. Bottom-up theory sees the mind as a blank and incurious organ, passively accepting and dispassionately examining every one of the zillions of bits of data continually presented to it. The decision as to what will be said to have been experienced simply awaits careful and unbiased evaluation of all this

evidence. Decision-making is a purely reactive process. There is no questioning, anticipating or presupposing. All decision is coldly based on evidence presented and all evidence is equally carefully examined. There is no prejudice or preconception, and no effect of context; no speculative inferences will be made and no judgement will be more likely than any other.

Top-down processing envisages a far more proactive mind. Your top-down mind is seen as actively formulating hypotheses all the time as to what might be going on. These hypotheses are, of course, founded upon experience, recent or remote. With its hypotheses in hand, the mind sets off into the world searching for related evidence. Your mind forms the relatively few questions necessary to interrogate the evidence to decide whether or not what it suspects is taking place is what really is taking place. Having actively sought the answers to its questions and found (often) its hypotheses confirmed, your mind may then begin to make decisions as to how to take things usefully or entertainingly forward and start seeking the answers to the new questions which will arise as a result. Because your mind, in this mode, is looking for relevant evidence, it discards, or ignores most of the incalculable amounts of material with which it is continually bombarded. It is selective in pursuit of its hypotheses. (If it had no hypotheses, of course, it could not sort information by relevance – information can only be relevant to something.)

Your mind is probably a curious, selective and proactive hypothesis-generating device continually searching for that minimum of data which will enable it to confirm or refute its hypotheses. Your mind probably interrogates the world unceasingly; however, it probably does not examine all of everything presented to it, but ‘skims’ incoming data intelligently.

We can easily see how top-down processing enables us to make good decisions quickly, based on much less, or less perfect, information than if we had to rely on pure, data-driven, bottom-up processing.

An example: my son is upstairs in his room playing the ‘Sergeant Pepper’ album. There are two doors between us, muffling the sound of the music such that I can barely hear it. It is, though, an album I know backwards. I feel I can hear the words and music clearly. This is nonsense, though. The truth is that I know it so well that I need only the tiniest and most imperfect hint of relevant musical information to make me think I can hear it all in detail. My mind suggests, from its extensive library of Beatles’ music, what I am almost able to hear; this and the tiny amount of real evidence I actually have is enough for me to experience it almost fully. If my son were to play an album I know less intimately I would experience nothing beyond very distant sounds.

A silly oversimplification as another example:

When we first arrive at Joe and Sara's party, bottom-up processing would have it that our minds are completely taken up deciphering the immediate and are free from any preconceived ideas as to what might be taking place behind their front door. When we get inside we look about us, assembling information, and finally conclude that there are a lot of folk dressed up to the festive nines, clutching drinks and behaving tremendously brightly. 'Aha!' we say 'a party!' (Had the house contained sheep we would presumably not have been much surprised as we had no pre-formed views on this or any other matter.)

Top-down processing theory, on the other hand, claims that as we come through the front door we expect to see people roaring at each other across many decibels of heavy rock. We gather just enough evidence to confirm this hypothesis (which, given the size and number of Joe and Sara's loudspeakers, doesn't take long) and can immediately begin searching for more data to take us forward, still within our hypothesis, for example for either Joe or Sara (we have to give our bottle of wine to someone).

Boringly enough, the truth probably lies somewhere in between and, as usual, it probably all depends... We probably use a variable mix of top-down and bottom-up processing. Some situations are highly predictable (Sergeant Pepper, for example, or getting up in the morning). In predictable, well-known situations like these a skeleton minimum of actual data will suffice such that we get the experience experienced or the job done. Other, more novel, situations will demand that better attention be paid to incoming data, to new information. Had Joe and Sara's house actually been full of sheep, for example, we would have had to fundamentally revise our hypothesis and search for a new one, and we would have had to deploy a much more thorough examination of the evidence.

It is often a question of novelty versus familiarity. Reading a romance or whodunit, for example, demands relatively little attention. There are relatively few new ideas or details. You've seen (or read) it all before. You can read it very fast and very well with little application and intermittent attention. This is why such reading suits airport lounges and railway carriages. Contrast reading a paper on, say, finding engineering solutions to the stresses on high bridges from intermittent and variable wind forces. This will need much more careful reading and much more bottom-up data collection. Skimming and inattention will only result in failure. We will need every fact, every turn of the argument, to understand. We cannot use knowledge already in our heads to guide us, as there is very little. (If you are a civil engineer, I abjectly apologise.)

We will return to this aspect of our minds but now we need to consider quite another: cascading analysis. How do we decipher the world or, in the context of a book on literacy, the written word?

Cascading feature analysis.

If we really do use a mix of top-down and bottom-up processing, and if we incorporate the excitatory and inhibitory connections we know to exist in the colossal quantities we know they exist in, we have the wiring and procedural requirements for a *cascading feature analysis* reading model as proposed by Rumelhart and McClelland (1986).

They not only proposed this model, but built it into a computer simulation. Their program 'reads' a vocabulary of some 1200 words of four letters or less, presented in a simple and consistent script. Within these rather limited parameters the machine reads accurately and swiftly. By altering the text it can be induced to make 'guesses' and errors. These are remarkably like those real people make under similar circumstances. Its reading 'behaviour' resembles ours. The model seems to be robust and plausible. It has withstood the test of time and the attentions of other investigators well. None of which is proof that we do read this way, of course, but the model is felt, nonetheless, to represent more or less what real life reading is very possibly like. This is how it goes, and how we may also go.

Figure 2.2 is a simplified diagram of their model.

+ denotes an excitatory connection (an on switch)

- denotes an inhibitory connection (an off or dimmer switch)

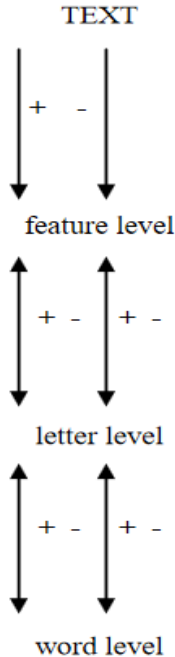


Figure 2.2 Rumelhart and McClelland's model of word recognition by cascading feature analysis. (Rumelhart and McClelland 1982, as cited in Ellis 1984 and many other texts.)

This model is, like so many biological processes, complicatedly simple. In other words the constituent parts of the process are simple, the procedures of which it is constructed are simple, but a large number of them may be simultaneously active. Correlate large numbers of simple things appropriately and you may achieve a complex thing. If you can do the simple things simultaneously, you can achieve the complex thing very rapidly, too.

Cognitive psychology shows us that this complex coordination of a multitude of simultaneous mini-achievements may 'simply' be a result of the wiring - of the patterns of connections between little grey cells or neural nets; 'simply' a function of the shape of the circuitry built up over time and as a result of experience and learning. Build the right circuits and the thing is automatic. Learning something is presumed to be the laying down of this circuit, this net of connections, rather than that one. Brave readers

may like to consider *chaos theory* in an attempt to explain the development of mind from matter in this astonishing way. In such case, try Abraham and Gilgen (1995) but first look at one or more of Stewart (1997), Gleik (1987), Cohen and Stewart (1995) or Ford, in Davies (1989).

How does a cascading feature analysis model work?

I need you to note that the model is entirely mute. It reads visually, making no reference to sounds. It simulates, in other words, direct, or lexical, reading. The model postulates that letters are recognised by visual feature analysis; by analysis of the visual features of letters alone. Letters are analysed by certain properties - a line here, a curve there, a bit below the line here and so on. A feature, once identified, is made to excite the representation of every letter which contains it and inhibit all those which do not (the + and - symbols on the diagram indicate this). Letters are rapidly and efficiently recognised in this paradigm. Suppose, for example, a letter appears and a down stroke (|) is identified. The representations of all letters which include such a downstroke (BDEFHIJKLMNOPRTbdfhlt) will begin to be activated. All other letters will begin to be inhibited. Suppose that this letter also contains a horizontal stroke (-). Representations of all letters containing a downstroke and this horizontal stroke will begin to be activated, and all others inhibited.

With only two features identified we have narrowed it down to a probable B, E, F, H, L, T, t or f. Recognition of a twirl to the right at the top as well as the two features already identified, but no others, would home us in on the letter f. We got there in three, in fact. If the program were to contain a little battery of, say, a dozen or so features against which letters are checked we can envisage it building into a comprehensive letter recognition system. And if the program is simply produced by wiring up particular connections in particular circuits or, in biological terms, *neural nets*, or pattern associator networks, then it is also an automatic and robust system. It will also cope well with imperfect material (and see notes to this chapter). Once the circuits, the neural nets, have been built (which is what learning is, in this paradigm) then the ensuing use of them is forever automatic. Letter recognition will have become, as it is in fact, something we 'do without thinking'.

It is time to interject another short deviation to examine what seems, at first sight, to be a paradox. It would seem to make sense to postulate a feature recognition system of great specificity, a meticulous, pedantic system demanding precision in detail. On the face of it, it would seem likely that we would have a feature recognition system which is tremendously precise, a recognition system which very precisely identifies features and which then matches them very precisely with other features to achieve very precise

recognition. Such a system would really be a thing to be proud of, would it not?

In fact, it would be a disaster. It would be next to useless because, of course, in the real world hardly anything is ever truly precise. Consider, for example, the dog. We can all recognise a dog for what it is – a dog. We do this, on the strength of just a brief glance, very fast, very accurately, very consistently and very definitely. We do it so easily that it seems deeply unsurprising. But dogs come in a large variety of shapes, sizes, colours, degrees of hairiness, bounciness and so on. You can, nonetheless, easily recognise a dog even if you only get a glimpse of a bit of it for a fragment of time. You can recognise a dog from any angle; from in front, from the side, from behind. You can recognise a dog this way up or that way up. You can even recognise a dog the likes of which you have never seen before.

What are we, probably, doing here, when we identify a dog as a dog? We are probably applying a shortlist of feature ‘questions’ (and, as we have seen with letter identification, probably quite a short list will do). We probably apply the shortlist to the evidence, to the data coming in, and accept features *even if they are only approximate*. By accepting approximations, but using a feature list which is long enough, we can swiftly identify even completely new examples of known categories (such as dogs). Maybe we categorise something as a dog if it shows, say, 10 out of our 12 listed features of a typical dog to a degree of, say, 85% satisfaction? Very occasionally we may (very occasionally we do) get it wrong, but it probably won’t happen very often and is probably an acceptable risk for the enormous gain in flexibility.

If we had to learn and carry about exact recognition units for everything we had ever seen, from every angle and in every circumstance, our brains would have to be the size of large water melons – and we still wouldn’t be able to recognise anything we had not seen before in exactly that situation. (You may pursue the advantages of *fuzzy thinking* in Kosko 1994.)

Back, then, to figure 2.2, the diagram of cascading analysis letter recognition, fortified with the knowledge of our own productive inexactitudes. Let us take the story up from a point where we have a few letters sort of identified. These letters will begin to excite word (or morpheme or letter pattern) units which share features with them and will begin to inhibit those which don’t. Suppose we have almost fully recognised three letters in a row, each letter incorporating a circle, the first with a line running up from it and the last with a line running down. Letters like o, a, p, q, g, b and d will begin to twitch but even while the cascade toward full letter identification continues the search for word identification can begin. With the first and last letters containing lines up and down as described, and with three circles in a row, words like dog, dag (to clip the wool

from around the tail of a sheep), bap (a bread roll), bop, bog will be tickled.

You will have noticed that up to now the whole procedure has been bottom-up. The model has simply been reacting to the evidence on the page, the incoming data. The program, however, also begins, from an early stage, to formulate its hypothesis as to what the word is likely to be, given the context in which it is immersed. The model begins to use what it already knows about context and the syntax of its language to search incoming data for such details as will confirm or deny its hypothesis. For example, in a section about dogs, this three letter word is far more likely to be dog than it is bog, bap, dag or bop. Prior knowledge has enabled the data to be interrogated and the correct decision approached even while the data search is still incomplete and the data ragged and unclear. This is top-down reading, using the mind's content, including the context of our present reading, to interrogate data proactively, to presuppose what the text may contain and to examine it for agreement.

Is this how we do it? Do we form a hypothesis as to what text says and then question it?

In the real world of literacy some research indicates that fluent readers reading easy or predictable text may be going too fast for there to be much effect of context or prior knowledge on the reading itself; too fast for there to be much top-down reading. Such reading may be done almost wholly bottom-up - almost entirely based on decoding of the text itself. When not going so fast, for example when the text is more difficult or when the reader is less fluent, the effect of context and prior knowledge increasingly matters, and reading becomes more biased towards a top-down procedure. It is a flexible system which trades reading procedure and task difficulty off against each other to achieve maximally effective performance.

This is the famous *interactive-compensatory* trade-off between bottom-up and top-down reading (Stanovich, West and Freeman 1981, Stanovich 2000) of which more in chapter four.

The procedure we have described is *feature analysis in cascade*. It is called this because bottom-up feature identification traveling one way and top-down proactive feature searching the other are both active at the same time. Data is cascading one way and expectant search the other, simultaneously. The whole chain bursts into a buzz of two-way activity, final decision being possible a very short time after first presentation of the text. A decision is also possible, if our feature recognition allows for a degree of imprecision, even if the text is partial or distorted, as is so often the case in real life (much handwriting, for example).

Cascading feature analysis as described here may well be very much like what we really do when reading, except that we probably don't read letter by letter. It sounds outrageous at first but the fact is that we do not need to identify every letter fully in order to read. It is even probable that we cannot read to meaning and separately identify letters both at the same time. Consider figure 2.3 for a moment.

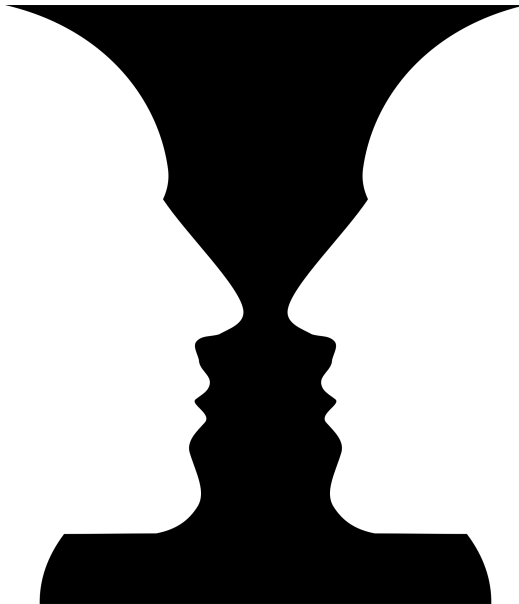


Figure 2.3 An 'ambiguous' figure.

Well, what did you see? This is, of course, the old cliché; either two faces or a thing like a vase. Please note, though, that you could not see both at the same time (Smith 2004 p. 18). You saw either the two faces or the vase, never (it is impossible) both at the same time. In other words, you may either see letters or words, but you can't see them simultaneously. It is not possible to see a visual stimulus as two different things at the same time. You may see different things in the same stimulus (you may see letters, or you may see words), but you cannot see them both at the same time. This dictum applies to text as to everything else, of course. (Spreading activation and onward processing may allow you to infer, or reconstruct, detail, but initial appreciation cannot be of two aspects of a stimulus at once.)

You are also probably familiar with the entertaining example of whole-word reading, as opposed to letter reading, which turned up in my email one astonishing morning. It read something like figure 2.4:

Try reading this at speed:

Aoccdrnig to rseerach at Cmabrigde Uinervtisy, it deosn't mtttaer in waht oderr the lttteers in a wrod are, the olny iprmoant tnihg is taht the frist and lsat lttteer be in the rghit pclae. The rset can be a toatl mses and you can still raed it wouthit dfificluty. Tihs is bcuseae the hmuan mnid deos not raed ervey lteter by istlef, but the wrod as a wlohe. Amzanig huh?

Figure 2.4 Writing in 'Jumble'.

It was easy for all to see, from this astonishing email, that when we read we read whole words straight to meaning, much of the time. Fluent readers are obviously not much concerned with individual letters or their placement in words. If I had written this book in 'jumble' you would be fluent readers in it by now. You would only falter with new or difficult words such as hippocampus, or Caerphilly perhaps. (It should be mentioned that the reference to research at Cmabrigde Uinervtisy is misleading. It's an urban myth. The email is still very instructive fun, though.)

And why (going all the way back to feature analysis), if we operate by seeking identifying features in letters, should we not do exactly the same for whole words? (That is exactly what I was probably doing when I read that email.) Supposing that in order to identify letters, which commonly present in so many different forms, we apply a list of 12 tests - does it have a curve here, a line there, a crosspiece there and so on? Why should we not be able to apply as many and as general tests to whole words, thus recognising them directly? Look at figure 2.5.

The headmaster at my last school
had a heart of stone.

You can get replacement parts in any
good D.I.Y. store.

Melissa spent the whole day staring
over a hot stone.

Figure 2.5

Did you manage to read those three sentences? Of course you did. Did you notice, though, that the last word in each was visually identical but 'read' differently? To have managed that reading without a hitch you must have been ignoring the detail of letters and reading words whole (and using context of course).

We will be meeting her at the
station at 4 p.m. tomorrow.

Figure 2.6

Letters, anyway, often disappear altogether. You read figure 2.6 easily enough, yet the 'ing' in 'meeting' and the 'ion' in 'station' have become mere squiggles in which letters are barely hinted at.

Now try figure 2.7. It is written in minimal feature text, a text in which minimal features of letters have been retained. You will find this 'depleted text' easy enough to read. If this book was written in such text you would, by now, find it about as easy to read as normal text. It is written in an alphabet designed as part of an experiment to determine how much of each letter of the lower case alphabet could be eliminated without seriously affecting legibility.

אָרבעטן און אַ פּראָצעדור פֿאַר אַ פּראָצעדור פֿאַר אַ פּראָצעדור פֿאַר אַ פּראָצעדור
פֿאַר אַ פּראָצעדור פֿאַר אַ פּראָצעדור פֿאַר אַ פּראָצעדור פֿאַר אַ פּראָצעדור
פֿאַר אַ פּראָצעדור פֿאַר אַ פּראָצעדור פֿאַר אַ פּראָצעדור פֿאַר אַ פּראָצעדור
פֿאַר אַ פּראָצעדור פֿאַר אַ פּראָצעדור פֿאַר אַ פּראָצעדור פֿאַר אַ פּראָצעדור

Figure 2.7

Experimental cognitive psychology.

And the *word superiority effect* supports this idea. This effect is shown in one variation on the venerable technique of *priming*, a stalwart of experimental cognitive psychology exploring the act of reading. Priming experiments, of one kind or another, have enabled us to demonstrate and explore mental lexicons and language pathways and to understand much of what we do understand of language and literacy management. (And see notes to chapter three)

For example, we know that our minds hold morphemes as *free morphemes* and *bound morphemes* separately. (In the words ‘laughing’, ‘singer’ and ‘wilted’, for example, ‘Laugh’, ‘sing’ and ‘wilt’ are free morphemes while ‘ing’, ‘er’ and ‘ed’ are bound morphemes.) We hold these as separate items in the semantic lexicon (where we hold language as meaning) and, if we want to produce, say, ‘singer’, we produce ‘sing’ and ‘er’ from there separately and join them together (*concatenate* them) en route to speech. We suspect this from analysis of the sorts of error we commonly make when speaking, but also from priming experiments (and see Taft 1991).

What is a typical priming experiment? If you were a subject of such an experiment you would find yourself sitting in front of a computer. You would be shown something (typically a word, or a letter, or a letter string) on the screen. This would be the *prime stimulus*. You just look at it while it’s on screen, without doing anything. The screen then goes blank for a short time and then another item (typically a word, or a letter, or a letter string again) appears on the screen. This item is a *target stimulus* and you have been asked to make a decision about every target. Your task is to indicate, as fast and accurately as you can, your answer to a question about it - for example, whether it is a real word or not. You do this, in this example, using two pre-programmed keys on the keyboard, one for ‘yes’ and one for ‘no’.

You may see anything up to about 100 *prime-target pairs* all told and may be one of many subjects undergoing the experiment. The speed and accuracy at which you perform are measured for each prime-target pair, by the computer. This gives a good idea how easy, or otherwise, it was to make the decision you had to make. Clever manipulation of prime-target pairs can give powerful insights into what must have been taking place inside your black box to produce such results.

As an example, let us now enjoy a *word superiority* priming experiment. You sit before a computer, fingers poised over the 'yes' and 'no' buttons on the keyboard. A prime stimulus appears on the screen. It is either a word, a non-word or a single letter. (It might be WORD or WORK, it might also be DOWR or KRWO. It may, though, be a single letter, D perhaps, or W). The screen goes blank, then up comes the target stimulus. It is a single letter. (It might be D or perhaps M.) You have been asked to indicate, as fast as possible, whether the letter appeared in the previous prime stimulus (as a letter or part of a word). You don't know this at the time, but the experimenter is actually only interested in what happens when the letter does in fact appear in both target and prime.

Now for the fascinating bit: On the occasions when the target letter was in prime and target, and when the prime was a real word, you will spot this faster and more reliably than when the target letter was in the prime but this prime was not a real word. Astonishingly, you will also do this faster even when the prime consisted only of the target letter! You spot, and react to, that D in the prime stimulus faster and more reliably when it is in a WORD than when it appears as a single D on the screen; when the prime-target pair was a real WORD then D you did better than when it was simply D followed by another D! In other words it is apparently easier to recognise a letter in the context of a word than the same letter when it is presented in isolation. Experimenters have tentatively concluded from this that we do, indeed, seem to read (common) words as whole words rather than letters (although, by the same token, we have obviously recognised the letters as well as the word as we spotted the D in the WORD).

Rumelhart and McClelland (1986) suggested that a word is easier to recognise as we normally seek and identify whole words rather than letters, if they are easy enough, which accounts for the speed with which we do it, but that exciting the recognition of a word also at least somewhat excites the recognition of the letters of which it is composed (by onward processing?), which accounts for our recognising the letters when asked to do so. Perhaps our representation of the letter, when it is in a word, is being excited two ways as a result. The cascade feature analysis search works up and down, as we have just seen. We may search for words by feature analysis but our search also cascades back to letter level, perhaps through mandatory spreading activation.

(And see Ellis and Beattie 1986, Rayner and Pollatsek 1986, Rumelhart and McClelland 1986, Taft 1991, Underwood and Batt 1996.)

One more example of cognitive psychological experimentation before we move on. This experiment demonstrates the mandatory nature of spreading activation and the way it instantly gets everywhere and affects everything. It illustrates, specifically, the *Stroop effect*. Again, you are sitting in front of a screen and again, stimuli appear on the screen. Some are words, some are line drawings. These stimuli are coloured, and your task is to press the appropriate button to indicate whether they are, say, green or red. You are specifically asked not to read any words which may appear, you are *only* to indicate the colour in which the stimulus appears (red or green).

OK. The word CAR appears in red and you press the red button. A red house appears and you press the red button. The word HOUSE appears, written in green script, so you press the green button. The word RED appears, written in green script, so you press ... the green button. This last task takes you significantly longer, because, of course, you are absolutely unable to avoid processing the stimulus and reading the word RED to meaning. This extraneous, but apparently relevant, information, naturally enough, interferes with your ability to respond straightforwardly to the colour green, so you hesitate and either take longer or make an error. You read the stimulus to meaning mandatorily and even though you had not intended to, and when you reach its meaning you find it contradicts the decision you were in the process of making as to the colour of the stimulus. The result is confusion and delay.

Summary of chapters one and two:

We have bitten the bullet. Since literacy undeniably takes place in the brain, particularly in its cerebral cortex, we have examined that organ and its processes and procedures unflinchingly. Much cognitive psychology was there, in fact.

We have seen that the cortex is made up of billions of 'little grey cells' arranged in columns which are, themselves, arranged in modules according to function. We have seen some of the anatomy of language management as performed in the left hemisphere, and the various mental lexicons where language is stored in different codes – phonemic, graphemic, semantic and various 'motor' codes. We saw that the mind may read through simultaneous top-down and bottom-up cascading analysis.

Since, as we saw, our neurons are so amazingly numerous and so extravagantly interconnected it follows that copious spreading activation is a pronounced and mandatory feature of mind. Processing, we saw, is parallel and distributed, it happens instantaneously, all over the brain at the same time. Different aspects of everything are considered simultaneously in differently specified areas all over the cortex. We have, as a result, formidable computing clout.

Cascading feature analysis, probably based on neural nets recognition and association units, allows our proactive minds to reach decisions very fast and accurately even with little information, and even with incomplete, degraded or distorted information. We very easily identify stuff, probably by the application of a small selection of feature 'questions' and by accepting the conclusion even if only approximate. We probably read by top-down and bottom-up cascading analysis of features and probabilities. The unit of text we actually seek to identify is, though, in usual circumstances, a whole word rather than individual letters, although the identification of a word also involves the recognition, at some level and to some degree, of the letters within it.

We have now reached the point at which we may begin to take all this theory out into the real world and apply it there. We start by examining the 'reading wars' in the light of all this cognitive psychology.

Chapter three.

The Great Debate or 'Reading Wars'.

In which the reader swirls among controversy, and listens to a dogmatic Secretary of State, and royalty, before considering the phonics / visual question and reaching peace.

This chapter will chew over the Great Controversy which still engulfs the world of literacy. This controversy is between those who claim that we learn to read through sound and that written language is a system representing sounds, and those who claim literacy is about meanings and that written language is primarily a visual system representing meaning. I will examine this fundamental issue with two aims in mind: first, deploying cognitive psychology to critique the idea that literacy is primarily based on sound, and second, to critique the debate itself.

You may find me relentlessly sceptical. It is on principle. I hope that you will agree with me that scepticism is a respectable attitude to take to any argument made from any research paradigm, indeed that to abandon scepticism would be absolutely improper. (Antonyms of sceptical, after all, include credulous, gullible, naïve, green and soft!). In better words than mine: 'Keep your eyes open and your old-fashioned but trustworthy mind a ceaselessly turning mill of questions ground with the stones of scepticism' (Lucy Mangan in the Guardian Weekend 31/3/7).

Scepticism, though, especially if it is expressed with any passion, appears iconoclastic, if not almost ferociously revolutionary. If I may borrow a metaphor from the peerless J.K. Galbraith, however: If the rotten door by which a person enters a room crashes off its hinges, that person gains a reputation for violence which may be completely unjustified – something should be attributed to the state of the door.

As usual, before we go any further our terms should be properly defined. This chapter will be about the place of *phonics* in literacy teaching and its limitations therein. But what will I mean by 'phonics'?

What I will *not* mean is the *alphabetic principle* – the principle that text represents language and that language is, for most of us most of the time, spoken language so that *one* aspect of learning literacy is grasping the principle that there are certain correspondences between letters and letter patterns and the sounds of our language.

These *grapheme-phoneme correspondences* may be rather intermittent and unreliable in many languages (but perhaps especially English) but they do exist. Letters, and patterns of letters, represent language and so, in part and imperfectly, they also represent the sounds of language. Of course they do.

But to recognise that is not at all the same thing as saying that text is sound written down. Clearly, and as we shall shortly see, it is not. The idea that writing is a representation primarily of sound is simply wrong and its corollary, that literacy is primarily to be approached by 'sounding out', is why the ongoing refutation of hard core, hard sell phonics expressed here and elsewhere is necessary.

By "phonics" then, I mean teaching that text is sound written down and that reading is therefore something we do, and must learn to do, by 'sounding out'. Phonic methods are based on these assumptions, often very rigidly. Such methods lend themselves wonderfully well to 'scheme' teaching and even actually scripted lessons. Phonics is often endorsed as required methodology following corporate lobbying by producers of very lucrative schemes (for example the No Child Left Behind ACT / DIBELS debacle in the USA and the synthetic phonics debate in the UK). Wherever large profits are being made, or could be made, our sceptic's antennae should twitch especially vigorously.

I begin this chapter with a rather light-hearted look at the 'reading wars', then consider the cognitive psychology of reading and the probable pathways involved in the understanding of spoken and written language. At this point we will have our feet in solid scientific and logical boots and can hope to stay upright while negotiating the slippery rocks around *phonological awareness*, the sacred literacy cow of our day. (Such cows come, but they go again.)

I admit this is a dense chapter, but the issues are complex, and the literature in which they are discussed is often similarly dense, sometimes a great deal more so. An open-minded and appropriately sceptical examination of this issue is important, especially at a time when some proponents in the UK of a single teaching method (synthetic phonics) are insisting that their method must be the only one deployed - that all other method must be outlawed - and this proposal is being seriously considered at the highest levels as I write. The standard of debate is low, occasionally abysmal. We must here give it sceptical, honest thought.

Politics, history and the teaching of literacy.

In Britain, 'progressive' and 'child-centred' education was advocated by the Plowden report, completed in 1966 and in tune with its liberal and optimistic times.

Governments and local education authorities of all political shades implemented Plowden and embraced its ethos. The pendulum swung, however, as they do. By 1996 Chris Woodhead, Head of OFSTED under Conservative and Labour governments, was declaring, approvingly, 'the burial of a concept of education that says ... that the innate potential of every child has to be unlocked ... [and] that that is what education is about' (BBC Panorama 3/6/96). The period of 'back to basics' was in full swing.

Every now and then literacy, at least in schools and at least for a time, makes the headlines. For a while heated arguments rage. The media go into overdrive. Tabloid newspaper editors find shock-horror schools to run flamboyant stories about. Hard-won scientific insights are mangled. Misquotes multiply. Teaching is widely held up to ridicule as a blind and random mix of political correctness, sedition, indolence and ignorance. Everyone airs their expert opinion; after all, everyone has been into a school at least once and we all know that 'those who can, do, those who can't, teach'.

Politicians react to the uproar by loudly taking up grandiose and synthetically radical positions hedged about with get-out clauses, and by having their photograph taken among smiling schoolchildren. The most recent research is heralded as the answer to everything and applied by diktat in every classroom. Tentative and subtle conclusions are reduced to sound bites, theories become dogma, black and white become the new grey.

Literacy has a peculiarly prominent place in western social mythology. It is seen as a magical, infallible source of wisdom and wealth, a solution to most, if not all, social problems. Few causes arouse as much passion as the seeking out, and then the dramatic remediation, of 'falling standards'.

Literacy '...has been seen as ever more central to the salvation or advancement of man and society.' (Vincent 1989 p.2). For something so 'central to salvation' it is striking that literacy is seldom defined when breasts are being beaten about its decline, nor is it always material to the breast-beaters whether a decline is, in fact, taking place at all. The sound of axes being ground, or prejudices stirred, is often plainly discernible. Arguments as to remediation are antique; methods now hotly promoted or strenuously despised were just as warmly debated in the nineteenth century as they are now. (Graff 1991, Soltow and Stevens 1981, Vincent 1989 and 2000)

In the words of the Bullock report '... the main arguments of how reading should be taught have been repeated over and over again as the decades pass, but the problems remain.' (Dept. of Education and Science 1975).

Rational discussion is hampered by the fact that everyone regards themselves, and any

and everybody else, as absolutely expert in the field of education. The man on the Clapham omnibus, in the belief that he remembers his own well, feels he understands it perfectly. The status of the educational professional is correspondingly small, and public discussion frequently overheats. The duty to seek, evaluate and then respect evidence is widely overlooked, sometimes wilfully. As Pumfrey comments (1992 p.3) 'The possibility that reading standards might be falling resulted in a severe decline in the standard of public discussion of the issue'. Half a statistic and a sound bite are all it may take to precipitate an outbreak of churning national concern, with the inevitable demand that 'something must be done!' Often, and not always happily, it is.

The debate, known as the *reading wars*, (eg Coles 2000, Frank Smith 2004, Stanovich 2000) is presently hottest in the USA. It began as a debate between the proponents of highly regulated, imposed phonics teaching as the royal route to reading and those who favour a more visual and holistic approach more embedded in language experience - the 'real books' and 'whole language' approaches for example (Holdaway 1979, Stauffer 1970).

Those who favour phonics regard the opposite camp as utopian romantics and are themselves regarded, in return, as authoritarian reductionists. Each side in the debate seems utterly to despise the views of the other side. We will look at it mainly from the British perspective in the 1990s, the period when the battle raged most fiercely here. A headline from the Guardian newspaper of March 8th 1991 reads as follows:

CLARKE BACKS PHONICS AGAINST 'CRANKY' TEACHING METHODS

The article says that Kenneth Clarke, then Secretary of State for Education, '...gave the heaviest ministerial support so far to teaching children to read through phonics. He derided other teaching methods as '... 'cranky'.... Most of the new methods turn out to be no good at all compared to the traditional one.' (In the Guardian a few days later (12/3/91) Glenys Kinnock hit back: 'Somehow the 'real books' phrase has become a term of disapproval... a war cry for the ignorant.') People dug fortified trenches and occupied them for the duration. What actually takes place in real classrooms was caricatured ruthlessly, on all sides. Much of the most enthusiastic sniping was done by non-educationalists at several removes from the chalkface. A multitude of special interests stuck their various oars in and rowed vigorously in every direction.

What was going on? Was there really a decline in reading skills among primary school children? If so, was it anything to do with teaching methods?

The conduct of this debate is so important, as backdrop to this chapter and literacy teaching, that some history may usefully be dug up to display the phenomenon in 'real life'.

One of the most recent and influential scares about literacy standards was set off, and assiduously fuelled thereafter across the media, by a single psychologist, Martin Turner. Remarks made during the brouhaha following release of his report (Turner 1990) swiftly became part of the scare, though they were not part of the research. The Guardian of 7/9/90 headlines an article 'Psychologist blames bad teaching methods for 'worst fall' in standards' and in the article Turner claims that '...the proportion of children with reading difficulties has risen from 10 to 15 per cent in the last five years'. He went on to say that this was a fall in standards '...unprecedented in peacetime in modern educational history' and that 'progressive' methods of teaching were the reason for the alleged decline.

So loudly and frequently was this declaimed that it became the received wisdom of its time. By April the next year even royalty was involved. A headline from the Guardian of 23/4/91 reads 'Prince hits at school illiteracy'. Prince Charles is quoted accusing '...the educational establishment of failing children'. The Secretary of State for Education felt able to deride all literacy teaching methodology other than straight, pure phonics as 'cranky' and 'no good' to a House of Commons committee, in March 1991.

And almost all of the debate was founded on wet sand. Turner, eventually, admitted he had '...no data indicating which teaching methods had been used for the children in the survey.' (Guardian 10/12/90) On June 17th 1991 the Guardian reports that 'A new survey...will confirm a drop in standards but absolve teaching methods and say that the most important factors are family and social background'. (Though the Secretary of State repeats, in the same article, that '... progressive education has reduced children's basic skills'.) In evidence to the Commons Education, Science and Arts Committee in 1991 Professor Cashdan rebutted the Turner evidence and said 'We have not got a crisis'. Her Majesty's Inspectorate of schools (HMI) reported in 1991 that the data 'cannot contribute to a reliable national picture of reading standards or the direction in which they are moving or if they are moving at all' (HMI 1991 p.3). They concluded that there was probably no decline but that there was a '... small, but worryingly stubborn, proportion of the work in reading which is poor.' (ibid. p.3)

Other researchers reported only tiny fluctuations in reading standards, and great difficulty in intelligible measurement and comparison of these standards across time. Most denied that any valid conclusions could be drawn from the data we had, and

stated that fluctuations, if any, were probably not significant. (Cashdan 1990, Cato and Whetton 1991, Lake 1992, Pumfrey 1992) An article in the Independent much later (16/8/96) reported that reading standards had probably remained about the same over a period of 48 years, quoting an NFER study (Brooks *et al* 1995). Evidence from the adult literacy world indicated that standards were low but had remained roughly stable over many years (Basic Skills Agency 1995, Bynner and Steedman 1995, Elkinsmyth and Bynner 1994).

Notwithstanding the shakiness, not to say almost complete lack, of reliable evidence, political wheels turned and in the words of the Sunday Telegraph of December 15th 1996 'Thousands of children are to be taught reading ... the old-fashioned way ... in a move that reverses decades of progressive theory and is portrayed by critics as a return to the Victorian classroom. In reading, teachers will have to employ standard worksheets and exercises such as phonic drills which have rarely been used on a large scale in the classroom since the fifties'. Many educationalists felt that teaching methodology was being wound back to the 'barking at print' era with little, if any, evidence that such a reversal of praxis was necessary, let alone desirable.

The standard of debate was embarrassingly poor on two counts. Weak evidence was treated as if it were robust and important inferences, supported as much by prejudice as real evidence, were very publicly and assertively drawn. Nowhere among the evidence was there any data indicating causation. It was, as a result, conveniently possible, albeit improper, to attribute the purported decline in standards entirely to the perversity of the teaching profession, 'progressive' teaching and the newly coined 'educational establishment'. It was reassuringly possible, and politically expedient, to avert the gaze from the abundant, and excellent, evidence we have had for years showing clearly that literacy performance correlates rather poorly with school factors but very well with social class and social advantage measures. (Bynner and Steedman 1995, Lake 1992, Parsons and Bynner 1998, Pumfrey 1992, Reid 1998, Statham, Mackinnon and Cathcart 1989.)

The whole debate was a fine illustration of the power of ignorance to generate hot air. Policy changes were made, and implemented, powered entirely by this hot air. Chalk-and-talk, drill-based, traditional teaching methods, especially the teaching of literacy through phonics, were enforced in classrooms from the early 1990s. To call a teacher 'progressive' became an insult.

The lurid colours of argument have become more pastel now, and the knives are

wielded less ferociously, at least as this is being written and at least in Britain, and the public no longer concerns itself much with the debate. The 'real books, whole language' army is scattered and demoralised and the field of battle empty apart from the occasional band of bloodied fighters most concerned with survival and minor acts of subversion. Phonics is in the ascendancy and the battle, a pallid shadow of its former virulence, continues mainly among phonics aficionados who espouse either analytic or synthetic versions of phonic attack. A malign side effect of the virulence of the debate and the inability of politicians to resist bandwagons has been and is the central imposition of prescriptive methodology and curriculum in schools, an authoritarian governance of the teaching profession. Teachers, particularly inexperienced teachers, have been disempowered as a result (e.g. Vivienne Smith 2004).

The reading wars proper may be in abeyance in Britain, but they recently erupted again, across the Atlantic. In the fall 2000 edition of *Reading Today* (the newspaper of the International Reading Association) it is felt urgently desirable to mount a defence of non-phonetic teaching methods. A leading article deems it necessary to publish extracts from the American National Reading Panel's report on the teaching of reading in schools in the USA which point up the shortcomings of phonics-only approaches, as apparently presently being pushed by '... the 'phonics good, whole language bad crowd' ...' (*ibid.* p.10) (Prompting an educational advisor to California State to say of the International Reading Association 'Why don't they go someplace else?' Coles 2000 p. xiv.). They quote the scientifically prestigious National Reading Panel as saying that

'Phonemic awareness training does not constitute a complete reading programme ... there is a need to be cautious in giving a blanket endorsement to all kinds of phonic instruction ... there may be a tendency ... to allow phonics to become dominant, not only in the time devoted to it but also in the significance attached.' (*ibid.* p. 10)

Newspaper editorials across the US thunder with forthright and absolute assertions such as '...phonics and phonemic awareness are the only key elements in early reading instruction – the cure-all to all reading problems.' (The Indianapolis Star was the organ quoted in this instance, a fierce editorial written during the annual conference of the International Reading Association held in that city in 2000.) As in Britain, governmental decree has been invoked to enforce particular approaches, with heavy emphasis on phonics as core methodology. Sometimes teaching is prescribed in very considerable detail, even to the extent of enforcing centrally scripted lessons and assessment regimes (for example under NCLB and its sequelae including DIBELS). In some American schools, management monitors in soft shoes drift creepily among the corridors applying

their ears to classroom doors to enforce precisely exact adherence to lesson scripts by the appalled teachers within (personal communications throughout 2006 & 2007).

Let us look at this debate, or war, dispassionately:

The reading wars began when the first research appeared showing that *phonological awareness* correlates with later reading ability (eg Chall 1967). (Phonological awareness is the ability to distinguish spoken phonemes by ear – to hear the constituent sounds of language. It correlates well with learning literacy in that children who are good at it usually go on to learn to read quicker and better than children who do not. The question is what, or how much, does that mean?)

The debate has been much bedevilled by weak or absent definitions – for example, what is meant by reading? Is it simply word recognition, an easily measurable ‘barking at print’ concept, or is there more to it? Is phonological awareness merely correlated with reading ability (whatever that is), does it predict it, or does it actually cause it? Many commentators suggest the last; in other words that phonological awareness is an essential, causative prerequisite of reading. The research evidence does not support so strong a claim, however (see Castles and Coltheart 2004 for a review). There are many axes being ground and many personal and political agendas confusing the issues.

Many research articles have demonstrated the correlation between phonological awareness and subsequent reading ability (good accounts are given in Bradley and Bryant 1993, Goswami and Bryant 1990 and Stanovich 2000). However, correlation is only correlation and shows, of itself, nothing more than correlation.

For example, wealth correlates well with health – the more money you have, in general, the healthier you are. The well-off tend to be much healthier and live longer than the poor. However, nobody suggests that this observed correlation means that money *per se* brings health – that cash perhaps radiates health rays so that the more of it you have the healthier you become. What the correlation indicates is neither more nor less than that there is a positive relationship between the two variables, between wealth and health. More of one tends to go with more of the other. Once we reject the idea that money directly causes health, we are obliged to seek the reason, or reasons, for this real enough relationship elsewhere. All that money, or lack of it, must be affecting the lives of people in some way to produce such a strong correlation so consistently, but the proximal cause, or causes, of the correlation lie elsewhere, among the complexities of social realities which wealth (or poverty) indicate. The correlation is simply a signpost towards some interesting ideas; the signpost may be real, but it is only a signpost, not

the destination. We must do more digging, and thinking, if we are to find truth.

Indeed, while engaged in this sacred sceptical work we need to consider our direction of travel. Are we moving forwards, or round in a circle? Perhaps our ability to discriminate among the sounds of our language and our ability to read, write or spell it are but two aspects of the same thing? Perhaps, like Pooh and Piglet, we are simply trudging with increasing excitement round and round a single tree? The number of footprints we discern in the snow ahead of us rises fascinatingly for every circuit we make but, in reality, this signifies approximately nothing. ‘...the relationship between [phonological] awareness and reading performance has strong implications not of causality but of circularity’ (Uppstad & Tønnessen 2007 p. 162) and perhaps ‘It is therefore, in light of the philosophy of science, high time to shout “the emperor has no clothes!”’ (op cit p. 163).

And it is a similar story when it comes to phonological awareness and later reading skill. That there is a correlation few deny (though it may be less robust and indicate less than we think - see Paris 2005 and later in this chapter); children with good phonological skills tend to do better at learning literacy than those without. The debate is about what that correlation means.

Many say that phonological awareness is the most powerful predictor of reading ability, and a real correlation does indeed make for a real predictor. Phonological skills do predict literacy performance, at least to a certain degree. However, many researchers point out that there may be, must be, other influences which more or less co-vary with phonological awareness. These other influences could be as important, or even very much more important, to reading acquisition than phonological awareness appears to be.

Why does a child who exhibits good phonological skills do that? And once you have asked that question you begin to see that there will, of course, be a plethora of influences intertwined in the child’s history which will predict his phonological skills, but this plethora of influences will also predict his reading ability. For example, the child who has been talked to a great deal, and been encouraged to respond in clear language, will reach school with better phonological skills, but he will almost certainly also arrive with all the other pre-literacy (or even early literacy) skills and practices which make it likely that he will ‘take off’ quickly (e.g. Hart and Risley 1995). He will probably have had many years of highly individual educational experiences which will have left him with a range of skills and appetites which are bound to affect his interface with literacy once he reaches school. These experiences are mostly unknown, and unknowns are what experimenters call *confounding variables* - all those myriad and mysterious other

influences on our results which will affect them more or less powerfully but in unknown, perhaps even absolutely unknowable, ways.

The largest elephant in the room in this regard (a beast so large you can hear his breathing permeating all the literature on this subject despite his continuing near-invisibility therein) is the personal history of each child and especially the degree of social and educational advantage or disadvantage from which he comes. Socio-economic status (SES), for example, has long been recognised as a very powerful predictor of many things - one of these being exactly such pre-literacy skills as we discuss here, including such aspects of general language facility as phonological awareness, and another being all those attitudes and aptitudes which are so necessary to float easily, and early, in school (e.g. Bowey 1995, Duncan & Seymour 2000, Hart & Risley 1995, Raz & Bryant, 1990, Whiteley, Smith & Connors 2007). Here is causation enough, real and sufficient.

Let us examine all apparently conclusive scientific findings with our feet yet firmly in the everyday, the common, the probable and the humane.

Phonological awareness or letter awareness?

We have been considering *confounding variables* and an obvious one, to return to the cognitive context at any rate, is *orthographic knowledge* or *letter awareness*, which is very much less pursued in the research world but which is also powerfully correlated with later reading success (Barlow-Brown and Connelly 2002, Blaiklock 2004, Gallagher *et al* 2000). 'A causal relationship between phonological awareness and reading ability has not directly been established ... performance on phonological tasks may tap into letter-based, rather than purely phonemic, representations' (Whitney and Cornelissen 2005 p. 274). And: 'The National Reading Panel's meta-analysis ... found ... that phonemic awareness instruction using letters helped children learn to read and write, but that phonemic awareness instruction without letters did not help children to learn to read and write' (Besser *et al* 2004 p. 17). And: 'We propose that preliterate phonological encodings do not include a level of representation corresponding to phonemes ... Rather, reading acquisition itself creates a phonemic representation, via linkages of graphemes to groups of phonetic features ... the phonemic encoding depends on a linkage to orthography' (Whitney and Cornelissen 2005 p. 289). And general linguistic ability, as you would expect, correlates with reading in exactly the same manner as does letter and phonological awareness (Nation and Snowling 2004).

Phonological awareness skill, in other words, is important – how could it not be in such

an incessantly verbalising animal as ourselves – but it is probably acting, here, more as a reliable indicator of the co-presence, and fundamental significance, of several influences on literacy acquisition, itself included. And all these indicators interact. ‘Letter knowledge also appears to influence the development of phonological awareness.’ (Blaklock 2004 p. 38). And ‘... it may not be possible for phonemic awareness to be acquired at all in the absence of instruction on the links between phonemes and graphemes.’ (Castles and Coltheart 2004 p. 104). One is tempted to say, to all this, ‘how could it be otherwise?’ (And see Morris *et al* 2003 and Reimer 2006).

Phonological awareness correlates with the acquisition of reading but is probably not causative of it and may not even be particularly necessary to it (see later in this chapter). Good (or poor) phonological skills are probably simply indicating the presence (or absence) of other skills. It is probably other skills, letter awareness and a grasp of the alphabetic principle, practised facility with language, which are really causative of, and fundamentally necessary to, the acquisition of reading. Children with good phonological skills have usually enjoyed an intellectual environment in which they have also been enabled to understand the alphabetic principle and become aware of their letters, and to converse.

There is also the fundamental ‘cart or horse?’ question. Is reading caused by phonological awareness, or does reading induce or heighten phonological awareness? Do we somehow pluck phonemes from the fuzzy and incomplete vagaries of speech and then apply this to reading, or do we learn about the ‘alphabetic principle’ and then find ourselves required, and enabled, to notice the sounds of our language in better detail than we bothered with for conversational purposes before? (See Adams 1990)

Certainly there is at the very least a reciprocal effect between phonological awareness and reading ability, each apparently affecting the other, and many researchers have clearly shown this (Gallagher *et al* 2000, Hatcher *et al* 1994, Mann, 1986, Morais *et al* 1979, Perfetti *et al* 1987, Read *et al* 1986, Whitney and Cornelissen 2005, Wimmer *et al* 1991). Interestingly, fluent readers of only non-alphabetic scripts (such as traditional Chinese characters), for whom phonological awareness is not particularly salient, show weak phonological awareness, but as soon as they begin to learn a language which uses alphabetic script their phonological awareness skills rapidly blossom. ‘It is not literacy in general which leads to segmentation skill, but alphabetic literacy in particular’ (Read *et al* 1986 p. 41).

All of these issues are dealt with in a recent review of research on the subject of whether there is evidence demonstrating a causal link between phonological awareness and literacy achievement which concludes that “... we do not think such a study exists in

the literature.” (Castles and Coltheart 2004).

There is room for real doubt as to the propriety of statistical methodology used in the typical research paper examining phonological awareness and relating it to literacy acquisition. There is therefore room for real doubt as to the validity of conclusions reported in such papers (Paris 2005). Paris argues that phonemic awareness is a ‘constrained skill’ - a sub-skill which is circumscribed and discrete. Usually such sub-skills are rather easily learned. Students therefore pass swiftly from a state of almost no skill to one of almost perfect skill in a short time. Paris claims this invalidates the usual statistical approaches to assessment of these skills; that the usual statistical tests are not valid with those constrained skills which alter fundamentally over very short periods of time.

And Paris goes on to say some other, more philosophically important things: ‘Educators should be wary of policies that require repeated assessments of constrained skills as indicators of a) individual reading achievement or b) successful programs.’ (Paris 2005 pp. 200-201) He talks about a ‘minimum competency approach’ which ignores the ‘emerging use and control of literacy’. (ibid. p. 201). This leads directly to a studiously overlooked, but deeply important, aspect of our fixation with, and constant assessment of, ‘minimum competencies’ which is summed up in Paris’ use of the word ‘control’ above.

One of the quintessentially fundamental questions for a literacy teacher is who is to be master? Is literacy to control the student or is the student to be master of literacy? Is the student to be intimidated by frequent, often negative, assessment of his minimum competences related to literacy or is he to be rendered capable of confidently using his own written language for his own purposes? Students easily learn to fear, and fail at, minimum competency assessments in a circular, self-fulfilling manner (as I have done with statistics, for example). Is the student to struggle to demonstrate mastery of a sub-skill or two, or become a fluent literate enjoying and deploying his own language, in his own voice and for his own ends? Is the student to remain cowed by uncertainty and potential humiliation, to keep his eyes timidly on the ground around his linguistic feet, or is he to learn to look confidently upwards, to reach for the stars and accept the occasional stumble?

And I have one final quibble for you in this regard and at this point.

Focussing on a discrete and constrained skill, like phonological awareness, leads us, so painlessly we barely notice the descent, down a steep and slippery path to biology, thence declining inexorably into neurology, thence fading inevitably into pathology and

finally sinking into the inescapable educational consequence which is to blame the victim, or at least his mind. This path is extraordinarily attractive (it exonerates us from all responsibility, and is enticingly laced with weighty neuro-jargon) but it is a thoroughly dubious one. It is paved with little more than linguistic tricks and shoddy logic.

Consider the following: 'It is well established that phonological processing skills play a key role in the acquisition of reading, and the corollary of this is that poor readers, and dyslexic children, have phonological deficits.' (Clarke *et al* 2005) From a *role* to a *deficit* in a single stride. When a skill - say phonological awareness - supports literacy, it is easy to describe it as a 'core skill' and phonological awareness is widely thus described in the literature, in fact. Not having such a core skill is easily designated as a 'core deficit' and not having good phonological awareness is indeed widely thus described. And finally, a core deficit easily becomes *the* core deficit (e.g. Shaywitz 2005).

We have, in a few easy steps, reached a 'deficit theory' of literacy failure and even 'the core deficit' itself. It didn't hurt at all. We never noticed the transition from firm knowledge to shaky conjecture and may go on to use conjecture cheerfully hereafter as if it were knowledge. The literacy failure, we comfortingly say, is clearly the result of there being something wrong with the student. We need look no further. He has 'the core deficit' (and see chapter 8 for a more serious critique of 'dyslexia').

And there is the perennial 'what are we really talking about?' question; the problem of definitions and implied realities. What is the 'reading ability' that researchers correlate with phonological awareness skills? Usually it turns out to be solely word recognition ability - or even non-word 'reading'. Often, testing either did not include any more than word or non-word recognition or found that more general skills, chief among them reading comprehension - the ability to get meaning from the written word, were not strongly predicted by phonological awareness. And where does phonological awareness stop and letter knowledge begin? How may we (and why should we) separate these?

And, as we are about to explore, how well does the idea that we read primarily phonically - by sounding out - stand up in fact? The indisputable implication of our present fixation with phonological skills, after all, is that we primarily read by sound rather than visually, that we read straight to sound in the first instance - but do we really? Perhaps the intensity of the passions expressed during the debate reflects the central position, the pivotal point that the phonics vs. visual dichotomy may really occupy in relation to literacy? If this is so, perhaps the psychology behind the debate deserves cooler and more detailed examination.

Do we read by sound or sight?

When we examine print do we 'see sounds', or do we see letter patterns (perhaps even some whole words)? Do we 'decode' text into sounds and access its meaning via these sounds or do we decode more directly to meaning, without 'hearing' the words at all? Do we access the mental lexicon by phonic or visual analysis, to use the jargon?

Language Management: speech to meaning.

Let us begin with a retreat of one step. Where is meaning? What is a 'mental lexicon' and how might such a thing work?

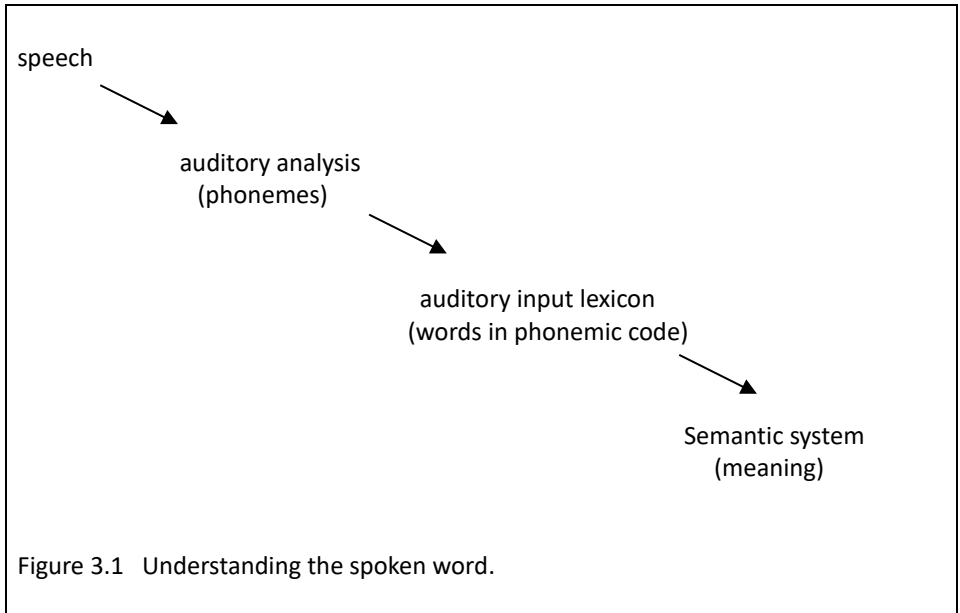
A lexicon is a mental store of language. We have already seen that we have several lexicons, and entries in each for somewhere around 50,000 words, and that we can reliably reach any entry in any lexicon in under a second (Aitchison 1987). We have also seen that our many lexicons hold language in various manifestations, including sound and symbol. Our lexicons are well connected and a representation in one easily excites its counterpart in another. We can access entries *in* our lexicons by hearing or reading language and we can produce them *from* our lexicons as spoken or written language. For those who are articulate and literate this feels as natural as breathing. It isn't.

What follows may seem ponderous and jargon-heavy as we explore these lexicons and the management of written and spoken language on its way to and from them. On the other hand we are building up a model of the reading process and its related cognitive psychology which is central to the understanding of reading and, come to think of it, all literacy. From it will follow most of what we can say with any confidence about literacy and the teaching thereof. The model will be invoked and developed throughout this little study. It derives, in the main, from Ellis (1993) and Ellis and Young (1996) and I commend it to your contemplation. It is a thing of interest and elegance as I hope you will shortly feel able to agree.

Figure 3.1 is a simplified outline of a postulated *direct* route from speech to meaning.

Speech reaches us as a stream of what physical analysis shows to be astonishingly indistinct sounds. These sounds, albeit imperfectly, approximate to *phonemes*. The auditory language analysis system in the brain analyses and guesstimates incoming speech into its constituent phonemes, then goes on to assemble these into words. At this point, the language is being stored as a form described by its sound, by phonemes. The words are being held in phonemic form, in *phonemic code*, in an *auditory input*

lexicon. Each word in this auditory input lexicon, each unit of phonemically coded language, can be matched to its corresponding entry in the mental lexicon we envisaged before, where they are held according to their meaning, according to *semantics*. This mental lexicon we will call the *semantic lexicon*. When a phonemically coded entry, in the auditory lexicon, is successfully matched with its corresponding entry in the semantic lexicon we can say that the spoken word has been understood.



I will now run another brief but important digression past you – on the evanescent phoneme. I have glibly pictured the identification and subsequent management of phonemes. There is a problem, however, as we have already noted. Spoken language is amazingly smeary. We mostly do not enunciate clearly, as newsreaders must. Analysis of everyday speech reveals it to be very messy stuff indeed. Phonemes are often barely delineated at all in conversational language; even word boundaries are usually very comprehensively blurred. Phonemes, in other words, are often not really there at all, except to a good speller who already knows they are there (who is, a lot of the time, re-inserting them where they ought to have been in effect).

Tiny examples: *wossu'?* is said, but you 'hear' *what's up?*, *eezaguboyinne?* says the man opposite and you 'hear' *he's a good boy, isn't he?* or someone shouts *wazaca?* but

you 'hear' *where's the cat*? You only 'hear' these phonemes if you already know how to spell the words of which you know they must be made. (Logically, this must be the case, even though you feel certain you hear them absolutely and precisely. This is a fine example of how your wonderful unconscious routinely puts together the best possible story for you from evidence which is usually thoroughly ragged and incomplete. See also notes to chapter 6.)

As Adams (1990 p.69) says '...however psychologically real a phoneme may be, it is acoustically evanescent... [phonemes] are not acoustically discrete.' and '...it is not just that knowledge of a word's spelling can influence the way in which people 'hear' its sounds but also the very likelihood that they will 'hear' a sound at all.' (ibid. p.401). Speech does not deliver phonemes reliably; frequently it hardly delivers them at all. Adams again: '...there is no way to know that, say, the word cat is composed of three phonemes except by having, somehow, learned that it is.' (ibid. p.69) We learn *phonemic segmentation* largely by learning to spell. (Read Adams 1990 pp. 65-81 for an elegant summary of the debate, as well as Goswami and Bryant 1990 and Scholes 1998.)

In short, the idea, so apparently obvious, that we naturally and innately 'hear' phonemes is a myth. We don't. We can't, actually, much of the time, as they aren't there. The fragmentation of spoken language into phonemes is largely a learned ability. It is learned as a result of learning to spell in an alphabetic system like ours. Logic tells us clearly that phonological awareness is, in plain English, secondary to letter awareness. As Goswami and Bryant point out:

...it is most unlikely that the progress children make in reading is determined by their sensitivity to phonemes. On the contrary, their progress in learning to read (or to read an alphabetic script at any rate) is probably the most important cause of awareness of phonemes.'
(Goswami and Bryant 1990 p. 26)

We use a small number of letters, combined in different ways, to represent language. Ours is an *alphabetic* system. Many languages (Mandarin Chinese, for example) use huge numbers of *logographs* - each delineating a word. Logographic readers (monoglot Mandarin Chinese readers for example) have relatively poor 'phonological awareness' skills - they do not particularly easily segment language into phonemes. (They do not need to - phonological awareness skills are, of course, less pertinent in logographic literacy than in an alphabetic system, though see Li 2002 and Perfetti and Zhang 1995.) However, if they learn to speak, read and write an alphabetic language they quickly gain

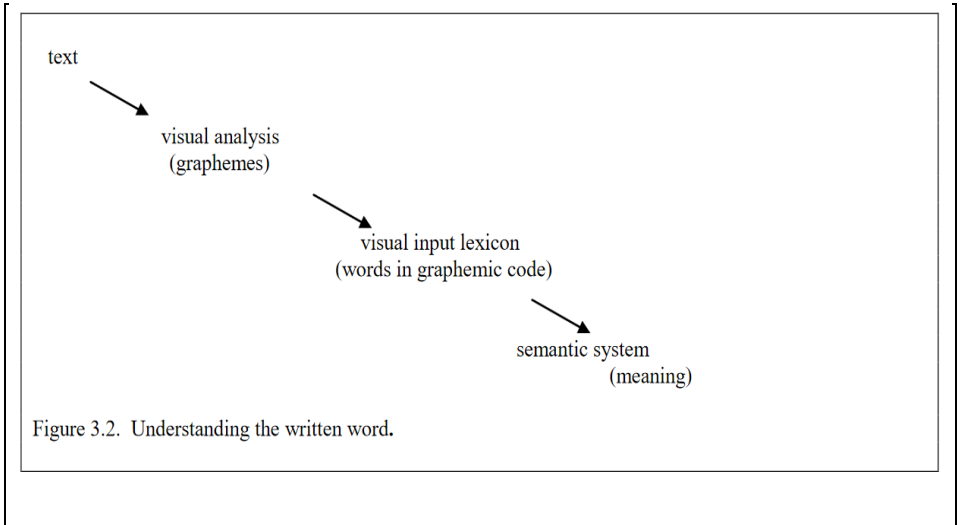
phonemic segmentation skills. The skills are the result, not a cause (or even a prerequisite), of their learning to read and spell with letters rather than the logographs on which they were brought up. (Goswami and Bryant 1990, Mann 1986, Perfetti and Zhang 1995, Rayner and Pollatsek 1989, Read *et al* 1986.)

The phonological awareness argument is, in other words, very much a carts and horses issue. It remains unresolved, despite being a sacred cow at least for the time being. Phonological awareness in children correlates well with, and so is indeed quite a good predictor of, their later reading performance. This has, though, and unjustifiably, been taken to mean two things: That phonological awareness is innate and that it is the fundamental cause of literacy success. The correlation then states that poor phonological awareness is also innate and is the fundamental cause of literacy failure and thus the basic pathology behind 'dyslexia' (and see chapter eight). As we have just seen, none of this follows.

Phonological awareness is learned through all those linguistic games children should play, all that conversation they need to have and all those stories they ought to have read to them. Pre-school literacy experiences 'cause' pre-school phonological awareness; they also predict literacy abilities. It is these early literacy activities, and hence early literacy skills, which actually predict later performance, and which also, incidentally (in an alphabetic language), teach phonological awareness, which helps, of course, in the learning of literacy (and see Adams 1990, Bryant 1993, Bradley and Bryant 1993, Ellis *et al* 1996, Goswami and Bryant 1990, Heath 1993, Stanovich 2000, Scholes 1998).

Now let us return to the further consideration of language management.

Language management: from text to meaning.

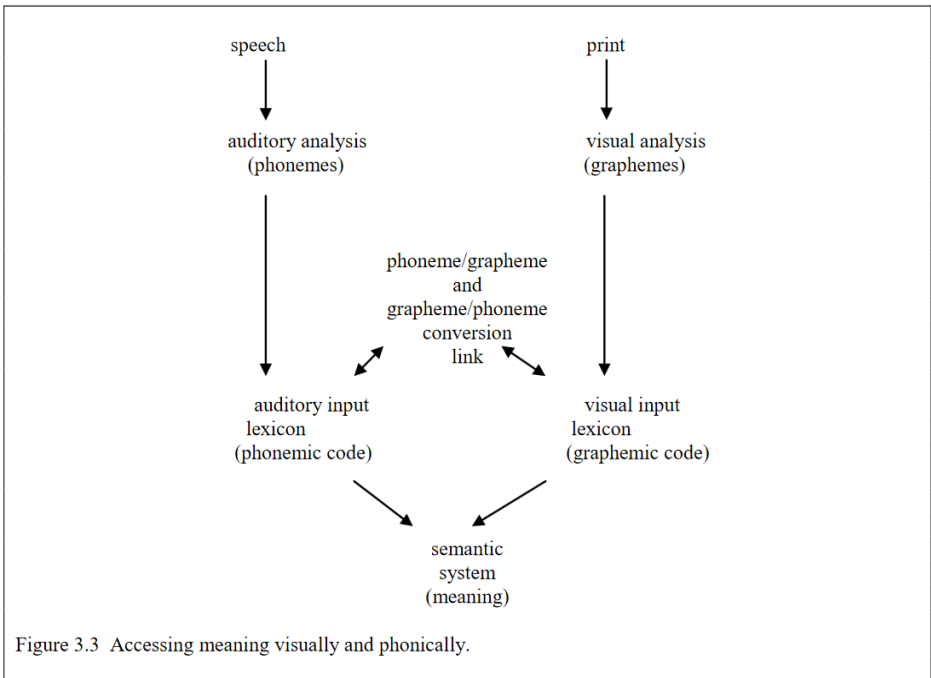


In figure 3.2 we see an outline model of visual reading - the *direct* route from print to meaning, a suggested cognitive psychological route to understanding of the written word. It works much the same as the previous model in figure 3.1, viz.: Text is seen. The information on the page, mostly *graphemes*, is sent from the eyes to the visual cortex right at the back of the brain. The visual cortex recognises the symbols which have just been seen and assembles them, if it decides they are letters, into the words (or morphemes?) of which they are part. At this moment they are being held in a visually recognised form according to their written symbol manifestation; they are in *graphemic code*, stored in a *visual input lexicon*. Each graphemically coded unit, or word, can then be matched with its counterpart in the semantic system and at this moment we can claim that the written word has been understood.

So far so good. We have a model which postulates routes for the decoding of language-as-sound to language-as-meaning solely by way of its sounds and also a model for the decoding of language-as-symbol to language-as-meaning purely visually. We have a model for direct listening to meaning, and one for direct (or *lexical*) reading to meaning. However, as you would, by now, expect, things are never quite as simple as that. We know that we can also 'decode' writing to sound, and thence meaning, very easily. We

do this, for example, when we read very unfamiliar words. We can even decode absolutely new words (names, for example), or even nonsense, from text into phonemes. ‘T’was brillig, and the slithy tove did gyre and gimble in the wabe...’ for example. We can also decode phonetically misspelt words to meaning, via sound. ‘Hee iz a phawmiddabel phello’ for example. How could we be doing this?

Our model, up to now, has no suggested route by which this might happen, no means of reading text and arriving at the sounds of the language it represents without going via meaning first. We need to add a route, in other words, to the model in order to show how we might read *indirectly*, via sound. How we might read *sublexically* and produce *assembled* meanings – sublexical or assembled reading. How we can read phonically, in fact. We need a system which can convert the representation of symbol into the representation of sound – translate graphemically coded language into phonemically coded language and, of course, vice versa. We need a *conversion link* - a pre-semantic interpreter or translator. This link between language held in graphemic code and language held in phonemic code will be able to explain our ability to read phonically, and also why we sometimes ‘hear’ an *inner voice* as we read silently, and visually, to ourselves. Our new, latest model is at figure 3.3.



To return to the phonics vs. visual reading debate, the reading wars. We have constructed a model which shows how we may do what we clearly can do, namely to read phonically. We can read print via sound; but do we? The evidence does not show that we usually do any such thing, in fact, merely that we are able to if and when we need to. There is, indeed, a great deal of evidence that we do not read to phonemes, we do not read by sound to meaning under usual reading conditions (by which I mean a fluent reader reading an easy text). (And see Adams 1990, Ellis 1993, Ellis and Beattie 1986, Ellis and Young 1996, Rayner and Pollatsek 1989, Smith 2004, Taft 1991, Underwood and Batt 1986.) Are we ever reading by sound?

'We can be confident that skilled readers do not access meaning via sound.' (Ellis 1984. p.55)

I ought to interject a small proviso here, too. This is all just a little too bald and inclines somewhat improperly, rather too far to the visual camp. It depends, in the end, just what, exactly, we mean by 'reading'. Much of the above, and some of what follows, derives from *priming* experiments. (And see notes to this chapter.) These experiments are fascinating, and give considerable useable insight, but they generally tell us about the processes of *word identification* - the identification of single words, usually isolated single words. They demonstrate that the lifting of single words from text to meaning is, indeed, a separate process from accessing the pronunciation of the word and is, certainly with easy or familiar words, done entirely visually.

However, we are conversational creatures and take our language overwhelmingly as sound. For most human beings, most of the time, language is experienced as spoken language. All mental activity is subject, as we have seen, to mandatory spreading activation. Stuff activated in one area and one modality (graphemic code, for example) will inevitably reverberate further and, after a small delay, activate related stuff elsewhere and in other modalities (phonemic code, for example). In other words, if we have sight of a word the sound of it will, after slight delay, be at least somewhat activated. When we read text we do indeed seem (sometimes at least) to 'hear' it as well, with the 'inner ear'. It is clear that we do not always do this when simply identifying single words, but it is more likely when we are reading continuous text, in sentences, particularly language in long, convoluted sentences.

There is evidence, indeed, that we probably do make use of the 'inner ear', in order to manage 'reading' at a higher level than simple word identification - to manage comprehension, in fact. Adams (1990 p.414) describes this as '...the irrepressible automaticity of skillful readers' spelling-to-sound translations' - another way of saying 'spreading activation'. The first words of a sentence (or phrase) must be remembered

until the last are read, of course, if the whole is to be understood. Adams claims that this 'translation' into sound is probably a mechanism whereby the text can be held meaningfully in short term memory, as it unravels, for the purposes of comprehension of the whole. She says that '... automatic phonological recoding subserves two distinct and critical processes. First as an alphabetic back-up system ... second ... it expands the reader's verbatim memory capacity in support of proper comprehension' (ibid. p.191).

'... normal silent reading takes place via direct visual access with phonological representations extracted from the lexicon for use in working memory. The indirect phonological route is seen as a back-up route which only comes into play when access via the direct visual route proves difficult or impossible. [or we could] ... suppose that the lexicon represents words in a hierarchy of different sized sublexical units. These units are both orthographically and phonologically defined. The phonological units may or may not be given much weight during lexical processing, depending upon the task requirements. If the task requires overt pronunciation, homophone decision, or a heavy load on verbally coded memory, then the phonological representation is given more importance than if a simple lexical decision response is required.'

(Taft 1991 pp. 91-92).

'The common ground for all positions [in this debate] is that direct visual access is important and that sound encoding plays some part.'

(Rayner and Pollatsek 1989 p. 109.)

... when a skilled reader fixates a very familiar word, access to its meaning occurs directly from print, with the sound of the word having only a minor role. When a skilled reader fixates a somewhat less familiar word, but one that has nevertheless been encountered before, then access to meaning directly from print and indirectly via the sound of the word may occur more or less simultaneously and in parallel.'

(Ellis 1993 p. 36.)

[Though logically these two recognitions cannot be exactly simultaneous, because text is a visual signal which must be visually appreciated.]

Reading is primarily a visual activity. Text is a purely visual signal (it is implacably silent) and the most direct, simplest, fastest and cheapest way to deal with it is purely as a visual item. '*Phonological recoding*' ('hearing' the text) may be the result of automatic spreading activation. On the other hand, when the fluent reader is reading very simple

text very fast such phonological recoding may not always occur at all. Possibly (the evidence is not voluminous) such recoding into sounds is a means of helping to hold what has been read in memory for long enough to enable comprehension of large and unruly pieces of text like, for example, this overweight sentence (Adams 1990). Ellis (1984 p. 59) says that ‘... the inner speech which accompanies much of ordinary reading does not provide the initial access to meaning but may afford a useful second pass through the language comprehension process’.

And to take all this into practice: Frank Smith says ‘...rather than phonics making reading possible, it is reading that makes phonics seem to work.’ (Smith 1985 p. 50). He also makes the points - blindingly obvious once made - that ‘... in order to apply phonic rules, words must be read from right to left.’ or at least read completely and then considered before their meaning or pronunciation can be accessed - as if they were read backwards (Smith [Frank] 2004 p. 143) (how will you know otherwise what to do with the ‘ph’ in graphic and shepherd, or how to pronounce stable or stability?) and ‘... phonics rules look simple if you already know what a word is.’(ibid. p. 143).

Smith’s examples include the letters ‘ho-’ at the beginning of eleven common words and pronounced in eleven different ways. (Hot, hope, hook, hoot, house, hoist, horse, horizon, honey, hour and honest.)

I, for the same purposes, will give you the ‘*magic E* rule’ or vowel/single consonant/vowel, VCV rule. This is a widely taught ‘phonic rule’ which states that a vowel followed by a single consonant and then another vowel is sounded long - it ‘says its own name’. Examples would be ‘cut’ becoming ‘cute’, ‘bit’ becoming ‘biting’, ‘lad’ becoming ‘lady’, ‘not’ becoming ‘notorious’, ‘a venerable bed’ becoming ‘the Venerable Bede’, and so on.

What then are we to make of home, but some and come; tone and tonic (‘phone and phonic, for that matter!’); wine vinegar; definitely finite; stove and glove; driver and river; tidy and city; likened and literacy; title and titular; pane and panel; potable potato potage; patron and patrol; mate, material, matriarch and maternal; idiomatic ideas and isolated islands; precious and previous; medicate and mediate; definitive and devious; secretary and secretory; calamity, celibacy and celebration; critical criterion; lemon, seven, and evening; metre and meter; idiotic and hideous idolatry; and on and on? (Consider the word ‘inevitability’ for a moment!)

To reach pronunciation in the face of such irregularly variable phonic irregularity, we need, as Smith says, to ‘read from right to left’. By this he means that we often have to have read the whole word to meaning before being able to utter it correctly. We must

already have reached the 'identity' of the word before we could pronounce it. In other words we must already have read it. We must have read it, visually, all the way to its meaning before we were able to access its proper phonemic representation, its pronunciation.

Berdiansky *et al* (1969) are cited by Frank Smith (2004 pp.143-146). They made a study of the vocabulary correctly spelled by a group of children all around the age of ten. Berdiansky and his collaborators attempted to formulate a set of 'phonic rules' which might be being used by the children to achieve the spellings. They found that the children had a correct spelling vocabulary of 6,062 words of two syllables or less, and some 3,000 words of three syllables or more. They found enormous difficulties in envisaging a feasible set of sound-based rules for spelling the 6,062 short words, and those rules they did come up with were laborious, complicated and implausible. They were obliged to give up altogether on the 3,000 or so words of three or more syllables as they added so horrendously to the complications. (The children, of course, were able to manage these words perfectly satisfactorily.)

In the end, they found an astounding difficulty in contriving a spelling system which was based on sound-letter correspondences if it were to manage even simple spellings of words of only one or two syllables. They found there were 69 'grapheme correspondences' involved in over 200 'spelling-sound correspondences'. They found 166 rules, but also 45 major exceptions involving some 10% of words - mostly the commonest words, of course. No fewer than 73 rules were found necessary to cope with the behaviour of vowels alone. (Remember we are only talking about very simple words of two syllables or less!) They could not identify reliable rules enabling any decision to be made as to when a word is to be spelled by 'phonic rules' or when it is an exception which must be managed as a separate item altogether.

Frank Smith's conclusion, naturally enough, after surveying this wreckage, was that the phonic rules paradigm had 'limited effectiveness at great cost to memory'. (I discuss rules *per se* sceptically, in the notes to chapter five.)

Finding examples (and not exclusively in the English language) to demonstrate the unreliability of sound as a guide to the appearance of a word, or vice versa, is a little like shooting the proverbial fish in the proverbial barrel. Spotting these 'absurdities' is an old game we all enjoy and could play for hours without repetition. Actually, though, these examples are only felt to be absurd because we insist on considering the English spelling system as one which is solely, or somehow ought to be solely, phonically organised. When we find a spelling which is not clearly transparent in its letter/sound

correspondences we upbraid it. Our spelling system, however, does a lot more than merely indicate the sounds of the language and it is perverse of us to reproach it for not doing so exactly at all times. We should rather be grateful for all the other information it gives us, making reading English so much easier (yes, easier!) and so much more interesting, at least for the fluent reader.

There is logic, linkage, meaning and history in there, and it helps a good deal (And see chapter five defending English spelling from a historical perspective). Our spelling system is a visual signalling system signalling to a visual recognition system and, where necessary, it sacrifices mere phonetic regularity in favour of meaning or relationship. Would you really find English easier to read if it were spelt phonetically? Don't you like the connection between would, could and should to be clear? And the difference between would and wood to be explicit - leap off the page at you? Would spelling workt, calld and landid help your search for meaning? Would you instantly know they were all past tense verb forms? What if you read landid and candid? Fancid and rancid? Mist and mist? Drest and jest. Past and past. Would you know that no and nollij were related? Sine and signal? How would you distinguish torque and talk? Week and weak? How would you spell work and walk? I could go on ...

Scholes (1998 p. 187) says

'There are no truly phonetic writing systems, nor should there be. The purpose of an orthography is different from that of a phonetic system. Orthographies are meant to convey meaning and they succeed in doing so by ignoring variations of dialect and idiosyncratic speech.'

Smith (1985) says that 'We learn to read by reading,' but how might we do that?

Researchers, when not participating in the reading wars, appear to have reached a sort of consensus that reading is, right from the start, primarily a visual and orthographically mediated activity. Could it be otherwise? '... this is not a viable possibility for a written language such as English in which the relationships between letter groups and pronunciation is inconsistent and subject to higher-level influences.' (Seymour, in Beech and Colley 1987 p. 32). And 'We conclude that even beginning readers can, and often do, read whole words without analysing the grapheme-phoneme relations in these words ... young children find it easy to take the logographic approach.' (Goswami and Bryant 1990 p. 34) and '... there is very little direct evidence that children who are learning to read rely on letter-sound relationships ... there is a great deal of evidence that ... they adopt a global strategy, which means that they either recognise the word as a pattern or remember it as a sequence of letters.' (ibid. p. 46)

Reading is not primarily a phonological activity. Visual decoding and speed are of the essence and should be specifically encouraged. So should the use of context. (All reading should be specifically aimed at meaning; I hope I can add 'of course'.) Stanovich, West and Freeman (1981) have shown that fluent readers reading simple texts are probably going too fast to make much use of context when decoding text and are, in fact, reading pretty well exclusively bottom-up - are accessing meaning solely from the text on the page. An 'interactive compensatory' but primarily visually mediated model probably applies.

In the early stages of reading, or when reading difficult text, meaning may be accessed using a mix of text and context, the precise proportions of mix being decided on a moment-to-moment basis by the mind. Bottom-up reading certainly frees top-down processing capacity for comprehension and assimilation at speed. It amounts, perhaps, to the difference between word recognition and reading. Reading is reaching meaning, a habit which tuition should seek to establish early. (Harrison and Coles 1992, Oakhill, in Beard 1993, Oakhill and Yuill in Funnel and Stuart 1995)

Some less technical evidence already touched upon (and see notes to this chapter) that we read primarily visually is our ability to produce the correct meaning for words which are spelled differently yet pronounced the same (*Heterographic homophones*); for example were/whirr; we're/weir; see/sea; made/maid; pray/prey; lee/lea; road/rode; no/know; need/knead, bow/bough, ruff/rough, missed/mist, way/weigh, saw/sore and on and on. If we were reading to meaning purely, or even mainly, by sound, these heterographic homophones would be problematic. We would experience a falter when reading them. We would be able to find the sound of the words, but how would we know which meaning to allocate to them? Between 'they're', 'there' and 'their' is but a visual difference, after all.

No; when we read one of these words to meaning correctly we must have accessed the semantic system, initially, without recourse to the sound of the word at all. Indeed, accessing the sound would confuse, exactly as RED written in green did when we looked at the Stroop effect.

Similarly, we can 'disambiguate' words which are spelled the same but pronounced differently, (*heterophonic homographs*), for example wind/wind; present/present; live/live; read/read; contract/contract; deliberate/deliberate; rebel/rebel; content/content row/row and on and on. Only once we had the meaning could we find the pronunciation. Clearly we are only locating the phonetic version of the words we read after the reading has already happened.

This is almost certainly what is happening even if we hear an 'inner voice' while reading, it is simply the onward processing of information which is already safely in the semantic system anyway; simply inevitable spreading activation reverberating round the systems of language management. It is almost certainly nothing more than a 'useful second pass' which may enable us either to double check our reading or to hold on to what we have just read for long enough to grasp the meaning of longwinded sentences which take a relatively long time to read. It is not, most of the time, the reading itself.

Phonics teaching, practice in phonemic awareness and segmentation, has a place in teaching early literacy. Of course it does. Language is largely transmitted between people by sound and we automatically apply sound, to varying degrees, to the practices of literacy. It remains, nonetheless, important that we remember that the phonic route to meaning is secondary, assembled and indirect. It is, relative to direct, visual reading, a clunky and laborious way to do it. Phonological text management is a secondary system; a relatively inefficient, slow, costly, sublexical and 'assembled' route to meaning. It is probably used as backup and as support for memory and so comprehension, switched into or out of the process as necessary.

Literacy itself is primarily a visual endeavour. It has to be admitted though, that it 'feels as if' it should be phonically done, because we normally talk and listen far more than we write or read. Precisely because of this seductive, but technically wrong, belief it is important that we remain aware of the need deliberately to present literacy to students visually, to exercise the visual pathways. Learners, from the earliest days, are well aware that 'letters make sounds' and will inevitably try to make them do this, sometimes inappropriately. We do not have to reinforce the very natural phonic approach. What we do need to do is to induce and support a visual approach alongside it.

In real life literacy we use both as appropriate. Training students to use one method of attack, and only one method of attack, will mislead at best, disable at worst (and see discussion of learning styles in chapter 8). Many adult literacy students struggle precisely because they have been taught that reading is sounding out, and only sounding out, an approach which often fails, of course, leaving them 'barking at print'. What they really need is flexibility around a basically visual approach, the capacity to deploy different means for different ends in different circumstances, just as we have.

We need to bear this constantly in mind because phonics is omnipresent and can be extremely seductive. Graded phonic programmes exist and are being produced anew. Some schemes demand (and I mean demand) exclusive phonics. There are ongoing attempts to enforce scripted phonic subskills training as the single, fundamental way to

mastery of literacy (See McGuinness, McGuinness and McGuinness 1996, the synthetic phonics movement emanating from Clackmannanshire, and *Reading First* in the USA).

Phonic attack seems to have an almost religious significance to many people and, to be sure, phonic schemes can seem to deliver marvellously controlled programmes which apparently progress from well-defined goal to well-defined goal. The complexity of literacy can be reduced to measurable simplicities. Graphs and tables can be drawn. Politicians love it because of this. Phonics is admired as a silver bullet solution in this statistics-led and measurement-obsessed age. Heads and principals love how systematic phonics schemes appear to be. It is easy to develop a circuit of hoops for students (and their teachers) to leap through (or fail to leap through). Written language is made to appear miraculously reducible to items, schemes, levels and stages. Students can be marvellously exactly classified or, even worse, diagnosed.

This reductive approach can all be seductively reassuring, especially to the uncertain or inexperienced - or the man with an agenda or a product to sell. Teachers are inherently practical, often very busy people. They may come to like the feel of firm and pre-ordained ground beneath the tutorial feet. Graded, measurable, apparently 'scientific' phonic schemes promise, and at first glance appear, to deliver this satisfyingly. This leaves me, at least, with a niggling question; are such schemes really for the benefit of students, their teachers, their management, corporations or politicians? A quote from the world of adult literacy:

'Many tutors have felt that phonic work gave a sound, unequivocal base of skills which could be imparted according to a systematic scheme that would sooner or later sweep up all the problems that a student might have The common experience, however, is that adults make but slow progress by these methods and usually find themselves quite unable to make the transition from practice-with-tutor to independent use in the real world.'

(Charnley and Jones 1981. p.11)

I should like to close this chapter with a summary of the reading wars issue written in the form of a caricature:

The whole-language faithful view the decoding-skills brigade as gaunt and humourless authoritarians in polished shoes who look as if they have just bitten into a lemon. All knowledge, to such desiccated people, is scientific; reality is revealed only in tables of figures; without a statistical formula there is no truth and statistics are truth. Children are ignorant and contrary; teaching is the cramming of facts or skills into these resistant

creatures. These dry despots insist that literacy can, and should, be reduced to nothing more than layers of mechanistic and isolated skills which can be built up into 'literacy' through the endless and regimented repetition of drills last used in Victorian times. The efficient mastery of decoding trumps understanding. Beauty is off the agenda, and radar, altogether. Rectitude in detail is everything and failure is evidence of pathology, or wickedness. Literacy is a purely technical issue and mechanical and explicatory methods are all that is needed to wrestle it into submission.

By contrast, the decoding-skills advocates see the whole-language tribe as sandal-wearing and hirsute vegetarians in enormous, elderly, sagging sweaters, wreathed in suspiciously fragrant smoke. These fuzzy and ill-shaped creatures have rejected science, along with all formal and structured knowledge, indeed along with the last couple of centuries, in favour of lentils and relativism. These befuddled throw-backs consider children inherently beautiful and wise and believe that immersing them in fine language and exquisite experience will cause them so powerfully to desire learning that it will inevitably occur. To explain or, even worse, to analyse will kill the spontaneous learner in every child, will irretrievably confuse that understanding of everything which is already within all of us, like a pure white light. Education is about no more than realising the beauty in selfhood which will open the floodgates and let the native potential free. All you need, in fact, is love (and a good book).

As you read some of the appallingly vituperative literature, occasionally, sadly, from the pens of people who you thought knew better, it can be hard to decide how far this really is a caricature and, as we all know perfectly well, there is truth on both sides. Those of a scientific, analytical bent surely have a point when they claim that understanding how letters correspond to sound is important to spelling, and also to reading though perhaps to a lesser degree. (Literacy does involve skills, after all, including the skill of phonological awareness in an alphabetic language like English.) The science is copious, but it has also been importantly challenged. It has also been abused. Many of the original conclusions of researchers may have been appropriately cautious, but have since been unfairly simplified, luridly publicised and over-zealously implemented.

Some children surely do need specifically guided instruction in the fundamental mechanics of literacy, and this may apply especially to those who reach school least well prepared. On the other hand, of course we should not teach people that literacy is only some rules - say about letter-to-sound correspondences - any more than we should teach people that Venice is just a lot of stones or that the important thing about Maria Callas was the anatomical detail of her larynx.

Language is so much more than our explanations of it. Literacy is not just decoding, but decoding is involved in it. And learning literacy (in an alphabetic script) does indeed result in phonological awareness but it also results in letter knowledge - the real truth is that everything is interwoven and reciprocal and that it is easy enough to teach literacy in such a way as to realise this. And children certainly do all need meaningful and inspiring whole-language experience of literacy, how and why to use it, especially, again, those who arrive in school least well prepared.

These are not mutually exclusive ideas, nor is it impractical utopianism to seek to meld them in a classroom. It is incumbent upon all of us to remain calm (and polite!) and rely on real evidence. We need to harness visual and auditory attack skills, meaning and pleasure, all into the traces. We must, at the same time, fill the wagon they pull with understanding, interest, confidence, autonomy, joy and inspiration. We are crossing a frontier. Our road is long and our destination is inevitably shrouded in mist and distance, but one thing is abundantly clear - we shall have need of a multiplicity of skills and a wide variety of tools on the journey.

Chapter Four.

Reading: what is it and how do we do it?

In which the reader thinks rather generally about reading, is introduced to interactive-compensatory reading, discovers she may not see what she sees and may see what she doesn't see, meets tunnel vision, chunking, saccades, fixations and the Ames illusion, and considers whether an error is always a Bad Thing.

‘People say that life is the thing, but I prefer reading.’
(Logan Pearsall Smith)

There are perhaps four must-read books on the general subject of the cognitive psychology of literacy. They are the classic *Beginning to read* (Marylin Jager Adams 1990), *The psychology of reading* (Rayner & Pollatsek 1989) which is aging but excellent science, *Progress in understanding reading* (Keith Stanovich 2000) (Stanovich is the most cited writer on this subject - this book is a collection of his most important work and his commentary thereon. Rather heavy, so take a deep breath) and another classic, regularly updated, *Understanding reading* (Frank Smith 2004).

I shall be using Frank Smith's work extensively throughout this chapter. I do not apologise. You may not - indeed should not - agree with all of everything Smith (or anyone else) has ever written. He undoubtedly overstated his case at one time for the role of context cueing in reading, for example. His writing remains important, nonetheless. So does his clear and intelligent thinking. You will find well-informed common sense in *Understanding Reading* and you will be much entertained by it. Smith is trenchant, not to say polemical at times, but also pithy and mellifluous. If I had to pick a single book to recommend, his would be the one. It is a (fairly) painless introduction to a sometimes difficult subject, despite covering it in considerable depth.

Smith, then, says (1994 p.2) that ‘Reading is less a matter of extracting sound from print than bringing meaning to it’. (Along with many other writers on the nitty-gritty cognitive psychology of literacy Smith does not believe that reading can be primarily a phonic activity.) He says that in real life reading is four things: it is purposeful, selective, anticipatory and based on comprehension (ibid. p. 3). He also claims (2004 p. 5) that ‘Reading print is as natural as reading faces’ and (ibid. p. 3) ‘Learning to read is not rocket science’. These are very cheering and enabling remarks.

Why do we read? In real life we never just 'do' literacy, we use it. We do something with it. We use it for something. We never just 'read', without purpose. (Even your reading of the ancient copy of *Hello* magazine you picked up in the dentist's waiting room had a purpose - not too much to do with the 'information' it held, perhaps, but a purpose nonetheless.) We always read in a discriminating way, even in dentists' waiting rooms. (Perhaps you chose *Hello* in preference to *What Car?* or *Farmer's Weekly*, and you probably only read selected bits of *Hello*. You did not begin at the beginning and read every word until you reached the end, nor did you feel that you ought to do it that way.)

We also invariably read with quite highly specific expectations of text. (You picked *Hello* in the clear knowledge of what you would probably read therein. You did not pick the even older magazine with the cover ripped off such that it was not identifiable, but you glanced over its contents page, which showed it was all about finance, before plumping for *Hello* in preference.) And all of the above is true, of course, for the simple, and single, reason that we only ever read in order to obtain some personally relevant meaning; in order to experience, learn or understand something.

Reading, then, in real life, is always directed at meaning. It is a highly structured, meaning-seeking activity. Literacy tuition should also be meaning-directed and meaningful but has not always been so, alas. Over a long time 'in literacy' I have seen many schemes, exercises and worksheets which were a long way from meaning. In truth, I have used some. The worst were such that no student could find any meaning in them. They were amazingly boring, even repellent, as a result. Students either plodded on dutifully, if glumly, in the belief that their tutor must know best, or left tuition altogether for a fresher, in a less educational, environment elsewhere.

If literacy is not embedded in real life, in genuine meaning, it becomes dull, distant, difficult and daunting. Under such a circumstance we all know what happens to pleasure, excitement, motivation and confidence.

The reading of any text at all, in real life, involves us very considerably. It is never passive, nor is it meaningless. Reading is an active process. In most circumstances we bring at least as much to the text as we will take from it. Smith (2004) usefully divides 'information' within and around reading into *visual information*, which the text provides, and *non-visual information*, which we provide. He points out the difference thus: Visual information is what you suddenly don't have when the lights go out, whereas even in the darkness you still have a lot of relevant information in your head - including your prior knowledge, your aptitudes, attitudes and affective states and your knowledge of the text already read. This is the non-visual information you are bringing to the reading. It is prior to the text and essential to making sense of it. Visual

information - the letters, letter patterns and words on the page - may seem like the senior partners in the practice of reading, but the plethora of expectations and prior information that a reader brings to reading may be at least as important to its success.

Reading, then, depends on two things. It depends on the text - its content, level, interest, clarity and so on - but it also depends on the expertise and expectations of the reader. For example, some readers keep themselves so completely informed about the doings of celebrities that the details of the wording in that copy of *Hello* magazine barely matter. There is relatively little text in that journal, and it is constrained to a few rather particular observations expressed in rather particular language, so even I would not need to pay very close attention to it in order to get the gist. We all know roughly how the *Hello* genre goes and what to expect from it. If we had picked up a copy of a medical textbook on the innervation and anaesthesia of teeth, inadvertently left on the waiting room table, though, most of us would have found the text much more difficult and the words themselves much more important to our reading. We are probably not used to this genre. It is unfamiliar and less 'natural' to us precisely because we bring less understanding to it (understanding of the conventions of the writing genre as well as of the knowledge and assumptions underlying the subject matter). We would have to read this book in a very different way than the way we read *Hello* to reach a similar degree of understanding. Reading, in other words, is always a trade-off between what is actually on the page and what we bring with us to the reading.

Interactive-compensatory reading: Smith initially overestimated the degree to which readers' prior knowledge, and the context within the reading itself, enable that reading. (He is an enthusiast.) It seems that fluent readers reading texts which are not too difficult, or which do not contain too many new facts, names or ideas, read so fast that they are probably barely using contextual support at all. There is so little time. They are probably, in these circumstances, reading by fully automatic and direct word recognition - reading almost solely bottom-up in fact. (Even so, the fact that the text is easy enough for them to be able to do this implies that it is supported by a great deal of prior understanding and accurate expectation.)

A less fluent reader, or perhaps the fluent reader who has decided to try reading that book about the innervation of her teeth, must attend more carefully to context clues. She may only reach full understanding of many of the words in such unfamiliar text if she uses support from the context in which they lie. This trade-off between '*context effects*' (readers' grasp of context and their use of it to support their reading) and direct and automatic *word recognition* is more elegantly named the '*interactive-compensatory model*' (Rayner & Pollatsek 1989, Reimer 2006, Stanovich 2000, Underwood & Batt 1996).

According to the interactive-compensatory model, then, word recognition is often fully automatic, assuming simple text and a confidently fluent reader. Words are recognised directly, without reference to context. The assembly of meaning takes place beyond basic word recognition and does not influence it. However, this applies only when the reading really is fluent and there are no surprises. Where a text is difficult, or perhaps written badly, then even a fluent reader may be driven to using what they already know, and what they have already read, to support, perhaps even to provide, word recognition. (Perhaps, for example, the constituent orthographic elements from which it is intended that textual comprehension should emerge are configured in so intricately convoluted a manner, the ideation enunciated in a vocabulary so inordinately and unnecessarily labyrinthine, that felicity, lucidity, coherence and comprehensibility are all but entirely obliterated and the salience of contextual environment exponentially increases.)

Tunnel vision & functional blindness: A weak reader is, of course, often in exactly this condition. To this reader the use of context and prediction will be especially supportive and may be appropriately used. In many instances, however, weak readers do not use 'non-visual' information well in support of their reading. They 'bark at print', in Marie Clay's wonderful phrase. They restrict themselves to persistent attempts to recognise single words by obsessively focussing upon them in isolation, and belabouring them, rather than using the friendly clues around the word or in their own heads. They feel (have been taught, perhaps) that reading should come solely from page to meaning, with any support other than pure bottom-up word recognition skill being somehow immoral or fraudulent. Many feel, to boot, that 'proper' learning is supposed to be painful; they uneasily feel that anything which alleviates this pain is somehow degenerate. They suspect any method seeking to avoid such pain, and any teacher suggesting such a thing. They feel that seeking or using 'extraneous' support shows how useless they really are (and how complex 'literacy' is and how clever everybody who uses it fluently must be).

It can be difficult to convince such a student that it is not only permissible but highly desirable (and common practice among fluent readers) to enjoy support wherever it may be found, and that the rockiest route is not always the best route. Convinced, though, they must be.

Smith introduces the useful concept of *'tunnel vision'* in this context. He considers an experiment. If a line of letters is briefly flashed before you, to either side of the dot you have been asked to fixate at the centre of a screen, then different amounts of assimilation, of 'reading', will occur depending on the letters, but also on you.

If the letters are apparently random [say, BILER HAR FEM HJULER IALT] then, although you will be able to report that you have indeed seen a line of letters, you will, perhaps, only have read, and be able to recall, the central FEM. Had the letters been randomly assorted English words [say, BUILD HAT FIG BORDER WHAT] then you will be able to report that they were English words and will have assimilated perhaps HAT, FIG & BORDER. Had the letters made up a moderately sensible utterance [say, BILLY HAD FIVE OTHER HATS] you might have read the whole statement.

In conditions one, two and three above the visual information in each case was similar, approximately the same number of letters in much the same patterns. Our ability to 'read' them varied, however. This variation can be attributed to non-visual information within the reader. It can be further demonstrated by pointing out that in condition one a Danish speaker might have read the whole line of letters because they amount to a (fairly) sensible utterance in the Danish language (cars have five wheels altogether). In case one the ability to capture the same visual information varied enormously, but this was due to the difference between readers of it, and nothing else. Danes caught it easily, English speakers with difficulty.

Smith (2004) writes that a monoglot English speaker would have '*tunnel vision*' in condition one. They would be in a condition of '*information overload*', with a plethora of items to manage and a shortage of time in which to do it. Under such conditions we may all experience tunnel vision, where our focus reduces to a tiny number of items. Not speaking Danish, we may only have been able to capture, perhaps, F, E and M in condition one, for example. These very few items fill our perceptual capacity. In this condition it is as if we can only see the world through a tunnel, bit by tiny bit. A weak reader is in this condition much of the time. Not only is a weak reader in this condition, so is an anxious reader.

If a reader is made, or becomes, apprehensive about reading they may 'focus in' very hard on the detail; narrow their field of view, real and virtual. This will blank wider textual and contextual clues as well as their own general or specific knowledge. The reading will become even more difficult and make them even more anxious, so that they focus even harder on ever more minute detail. In a short time they may reach a state Smith calls '*functional blindness*'. Certainly they may entirely cease to make useful progress in any direction through the use of their eyes. Their breadth of vision, actual and mental, has narrowed catastrophically. This horrible, and personally corrosive, effect may be seen particularly when public reading is demanded of weak readers. (And see chapter seven on affect.)

Apparently, there is a way to catch monkeys which takes advantage of this mind-

constricting effect, this application of mental blinkers. You chain a coconut shell to a tree trunk and put some peanuts inside it (these monkeys love peanuts). There is a hole drilled in the coconut shell which will just take a monkey's extended hand but which is too small for a monkey's clenched fist to pass. You hide and watch. A monkey arrives, notes the peanuts and squeezes his hand into the shell. At this point you yell and rush from hiding. The startled monkey panics and, with his fist closed round a peanut, is trapped. He is focused very intensely on a single aspect of his present reality. Of course, if he had time and peace he could see the wider picture and find a solution, he could perform to his true intellectual potential, but anxiety gives him tunnel vision, and catastrophic failure.

Memory & meaning: Meaning is key to learning. Meaningless material is difficult to remember. Meaningful material is remembered much easier (Baddeley 1982, Gathercole & Baddeley 1993). One reason for this is that meaningful material '*chunks*'. The fact that so much more could be assimilated in condition three (BILLY HAD FIVE OTHER HATS) rather than condition one (BILER HAR FEM HJULER IALT) in the example above illustrates '*chunking*'. We have an embarrassingly small, and very transient, *short term memory*. This memory will only hold around 7 'items', and only for about one second (Baddeley 1982). Without continual *rehearsing* these items will disappear from this memory very fast.

You will have seen people madly muttering a telephone number over and over as they frantically search for something to write it down with, and on. They know that if they stop repeating this number, even for a moment, it will be gone. This is because it is simply a list of disconnected items; it has no inherent 'meaning'; it does not 'chunk'.

But what is an 'item'? An item, in this context, is something which is manageable by memory as a single, independent, identifiable and particular thing. It has meaning. Chunking is the agglomeration of several meaningless items, which we would otherwise have to manage one by one, into meaningful chunks, making fewer, but larger and meaningful, items. Letters, for example, are exactly such detailed items, meaningless in themselves, while words are letters chunked into larger, but meaning-bearing, items.

Chunking enables several details (each of which is a whole item, if considered in meaningless isolation) to be considered and managed as a single, now meaningful, item. Clearly we experience greatly improved cognitive management of items when they are fewer, but meaningful. If asked to memorise the letters CTLRYAEI you have a problem. It is an eight item list, as presented. It is meaningless and hence inherently unmemorable. Even if you were to set to and learn this list of items you will almost certainly have forgotten most of it by tomorrow. Write the same list of letters as

LITERACY, though, and you have no recall problem whatsoever. In this second condition you 'see' only a single item which has meaning for you. In a decade from now you will still recall every letter accurately. You were able to achieve this stunning improvement in cognitive performance by chunking those eight meaningless items into one meaningful one.

An experiment (Gathercole & Baddeley 1993) elegantly demonstrates the effect of chunking, organisation, categorisation and meaning. People (probably long-suffering students) were divided into two groups and each person given 100 cards. On each card a single item was written. (e.g. lion, chair, dog, eye, soccer, elbow, doctor, tennis, dentist, rugby, ear, golf, pig, teacher, hockey, table, politician, elephant, farmer, knee, bed, foot, cow, sofa ...) Group one was given just five minutes to memorise the items. Group two was given just five minutes to sort them into categories. After five minutes both groups surrendered their cards and were then asked to write down as many items as they could recall. Group two, as you will have guessed, performs far better than group one, despite having had no intention to memorise the items and no idea that they might be expected to do this.

Group two has, of course, simply 'chunked' their items into categories, has organised a mass of bits of meaningless information into meaningful 'chunks'. Five categories are easily remembered. Within such a meaningful framework many 'items' fall naturally into recall. Spending time organising the information proved to be the best strategy for getting cognitively on top of it. Group one, of course, had insufficient time to think about organizing their material, so were reduced to trying to remember a plethora of items of very little meaning and with small relation to one another. This sort of thing is extremely difficult to do, especially under pressure.

Becoming able to 'see' words and patterns whole, rather than flailing about among individual letters, is chunking. Our minds obviously appreciate the amalgamation of meaningless details into meaningful chunks. Bringing our own previous knowledge and intelligent expectations to text very powerfully promotes this process of finding meaningful chunks.

The more we can induce appropriate chunking, the more user-friendly literacy will become. The fewer, and more meaningful, chunks we can divine the better. Demanding absolute rectitude in detail does the opposite. Such an approach causes students to fixate on detail and become anxious about performance. Literacy will become disempowering and intimidating, rather than something we just do.

Fostering confidence will take us further than demanding precision, even if this means

overlooking a little inaccuracy and a peccadillo or two on the way. Loudly noticing every single spelling mistake in angry red pencil, for example, inevitably prioritises detail over meaning. Insisting that every word be read exactly as written - not accepting a reasonable synonym for example - will do the same. Relaxing our grip on detail, paradoxically, may increase our grasp of it. It will also improve confidence, an error-reducing strategy *par excellence*. We will look at this outrageous idea again, later in this chapter and later in the book.

First: What is “seeing”?

What is reading, and how do we do it?

Presumably we read by eye, by seeing print? Well, yes and no!

How much of what we ‘see’ is constructed entirely from information gathered in by our eyes and how much is deduced or derived from ideas already floated within our mind? Well, it all depends! Frank Smith again:

The eyes are given altogether too much credit for reading... The eyes do not see at all, in a strictly literal sense. The eyes *look*, they are devices for collecting information for the brain, largely under the direction of the brain, and it is the brain that determines what we see and how we see it. Our perceptual decisions are based only partly on information from the eyes, greatly augmented by knowledge we already possess (2004 p.72).



figure 4.1

Let us play about with this idea a little. Look at figure 4.1. Many people are unable to 'see' what it is. Can you? Stop reading for a moment and look at it. At the end of this paragraph you can find what the original image was before it was degraded. Once armed with this information most people are able to 'make out' the figure and 'see' the picture. Once they have 'got it' they cannot, then, fail to 'see' it. Indeed, once they 'see' it they 'see' greater detail than is actually in the image - they 'improve' it in their 'mind's eye'. What is it? It is a picture of a Dalmatian dog, walking away from the viewer and sniffing the ground. (Roth & Frisby 1986. p.82.)

What was this 'seeing' that you did? Did you do it with your eyes, or your mind? If it was with your eyes alone, how come you had to be told what it was, and only then 'saw' it? Perhaps you could not see it until you were told what it was, but once you had been told you were also unable to return to the 'can't see it' state. How come your mental image, once you could 'see' it, was so much better than the actual image?

The fact is, as Smith says, your eyes 'only' collect visual information; it is your mind which 'sees'. Your mind constructs meaning from visual information. Your mind, in fact, controls what is seen. It instructs your eyes to fix on what it has decided is presently important, a decision it reviews moment by moment. Your eyes record everything at that point indiscriminately, in an unselective way. It is your mind which makes a decision as to what it is seeing; your mind which allocates meaning to the data collected for it by your eyes.

For example: When you see a photograph of someone with a venerable castle visible some distance away in the background, both images represented in two dimensions on the same flat piece of card, you do not see the person as several hundred feet tall posing alongside a castle, nor as normal sized but with a small model castle immediately over their shoulder. Your brain does not simply accept the data with which it has been presented, it interprets it, in this instance probably correctly. It makes an assumption, based on what it knows of the world, and tells you that the castle is a really big building which only looks small because it is far away. It was not told this by the data on the piece of card, though; the photograph, in itself, did not make this clear. The photograph actually showed a castle which, in relation to the person sharing the picture, was tiny.

A far more flamboyant demonstration of this is the wonderful Ames room illusion. Here, a carefully proportionately distorted room is built. The illusion is viewed from one point, through a small aperture in one end wall of the room. From this viewpoint the room appears absolutely ordinary. The wall to the left of the viewer, though, is actually much longer than the one to the right and gradually becomes higher, maybe reaching twelve

feet. The wall to the right is much shorter and tapers to under six feet high. The far right corner of the room is much closer to the viewer than the left. The walls, the floor and ceiling, the door and the (fake) windows, are all distorted to match such that, when viewed from the proper vantage point, the room appears to be a run of the mill living room. The proportions seem absolutely normal, viewed from that point.

Two apparently rather short women stand talking in the far left hand corner. They are much the same size. Then one moves a few paces across the room and stands against the far wall, to the right of the viewer. As she does this she grows, grotesquely, before our eyes. Standing by the right wall, she now utterly dwarfs her companion only a short distance from her - she must be at least nine feet tall. Her hair brushes the ceiling, and she stands slightly stooped to avoid banging her head on it. Her size almost doubled, just like that, right in front of us! Moving back to the side of the other lady she contracts to the same size as her, and they chat on.

Our mind had two impossibilities to choose between. Either the room was crazily distorted, or the woman, like Alice, just grew and grew. From the point we have been obliged to look, though, the room seems absolutely as all living rooms always are, so the only solution is that we do, indeed, have a woman who can smoothly and rapidly change her size just by walking about. Sherlock Holmes once told the long-suffering Dr Watson that “When you have eliminated everything else, whatever remains, however impossible, must be the truth”. We obviously ‘see’ whatever the brain decides must be the truth, however ridiculous that might be, all else having been eliminated as even more impossible.

And the truth is that visual information is hardly ever simple, clear, well-defined and unambiguous. In most real life circumstances, as researchers into vision have found to their cost, visual information is disjointed; a fiendishly complex and intricately mixed jumble of colours, intensities, angles and surfaces, and, to make matters considerably worse, often varying from one moment to the next. Most of the images we are presented with (and which we decipher so easily and accurately) are imprecise, with huge quantities of detail much of which is irrelevant, much novelty, much confusing context and often considerable movement. Equivocal stuff! How on earth do we make sense of it all?

Vision – is it data-driven or concept driven? Clearly the mind must be driven at least in the direction of the correct decision as to what it should see by the actual visual information itself, by the incoming data *per se*, by the data arriving from the eyes. If this were not so, of course, we would never be able to distinguish anything from anything else, we would not be able to tell a sow from a sofa, by sight alone. The mind's choice

as to what is seen is, therefore, at least partly what we can call *data-driven*, arrived at by force of incoming data. This is bottom-up processing, whereby the raw data at the 'bottom' of the process is deemed to be what decides outcome.

However, we can think along a bit and see that our mind has to analyse data and impose a structure on it in order to reach a meaning. Our mind must act on the data if only to reduce it to manageable, understandable amounts. Our mind, though, must do more than just separate relevant from irrelevant data, indeed unless it analyses raw data & begins to form hypotheses about what its meaning might be how will it be able to tell which data is relevant? In considering figure 4.1 you will recall that, despite a fair amount of visual information, you were unable to reach any meaning because you lacked a good hypothesis but that once you had such a hypothesis to test against the incoming raw data you 'saw'.

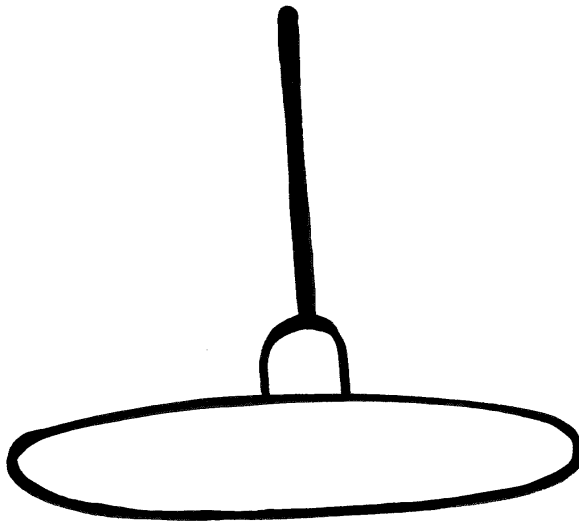


figure 4.2

Look at figure 4.2. It is a simple outline drawing. Read this sentence: 'The weather was so hot that we invited the neighbours round for drinks and some snacks done on the barbecue.' Stop reading, for a moment, and consider what the figure depicts. Perhaps you decided it was a sausage on a fork? Very possibly.

Suppose, however, I had asked you to read another sentence before looking at the drawing: 'John's father is in the navy.' I believe you might have seen the drawing as a submarine and deduced that John's dad served underwater.

Clearly, we can be induced to 'see' according to mental context. The decision as to what is seen is driven, in part at least, by the concepts knocking around in the mind at the time. We can call this *concept-driven* or top-down processing. The mind, in top-down processing theory, is held to be applying an active search for meaning to all incoming data, to be seeking and applying hypotheses to it. This has one very beneficial effect, namely that we can make meaningful decisions very quickly and based on often rather partial or incomplete data, we can 'see' even if the information we get is sometimes incomplete or confused, so long as we have some idea beforehand (as we usually do in fact) as to what the information is likely to be about; so long as we can form a plausible hypothesis, in other words. We'll get it wrong sometimes, but that's a risk worth taking for the extra speed and flexibility we get by doing it this somewhat slapdash way.

'Seeing', then, is a variable mix of top-down and bottom-up processing, matching data being collected by the eyes with information activated in the mind itself in order to reach the most sensible decision as to what is to be seen as swiftly and economically as possible. How much top-down and how much bottom-up processing will be needed depends on a trade-off between how much relevant information we already have available in our mind as well the clarity of the data itself. Once stated, this is obvious and common experience; the more we already know the less we need to look for in order to 'see'. We can put this slightly more technically: the more non-visual information we have (in our mind already) the less visual information (hard data) we need in order to decide what we have 'seen'.

Reading is not a special visual activity - it is just like all other kinds of looking. It seeks only personally relevant meaning. When reading a thriller or romance you can whizz along at high speed, paying relatively little attention to the print itself, perhaps even deciding to skip swathes of it altogether, yet extracting quite detailed meaning from it very rapidly and very efficiently. You know, in advance, pretty well what is coming up - the only surprises will be exactly those surprises you expect from the genre. You bring quantities of non-visual information to the task and need correspondingly less visual information.

Significantly, this kind of reading is often used as an escape, as relaxation or to kill time, when concentration is difficult and effort undesirable. These are the books you read on trains and in airport lounges. You do not read, in such places and for such reasons, heavy tomes on the effect on systems of government of changing patterns of mediaeval

land ownership, the application of modern market research techniques to educational planning in the eastern bloc or the writing of programs for the assessment and management of fuel requirement in intermediate-distance rocketry.

Such reading is much slower and much more demanding. You find yourself, when reading such heavy stuff, paying much closer attention to the print itself (the actual squiggles on the page) - you sometimes find yourself peering myopically, even fiercely at it. The work may be enjoyable, but it is recognisably work all the same and will tire your brain and your eyes. Your imperfect prior knowledge of the subject means that the amount of non-visual information you can bring to the task is limited and so the amount of visual information you must gather is correspondingly increased. You must examine the print far more closely than ever you did that in the thriller you read on the 17.35 out of Waterloo.

Saccades and fixations: When we read text it feels as if the eyes traverse the page smoothly and continuously, left to right and line by line, without interruption. Examination of the eye movements of skilled readers, however, reveals a rather more complicated process. Our eyes, when we read, are actually stationary for 90 per cent of the time, the remaining ten per cent being taken up with controlled but jerky movement on to the next pause. The period of sudden movement onward is called a *saccade*, the stationary period between is called a *fixation*. Each fixation lasts about 250 msec. (about 1/4 sec.). Each saccade takes about 25 msec. (about 1/40 sec.). We are, therefore, making just under 4 fixations a second and the eyes are moving for about 1/10 of that time. (As a matter of interest it is not only during reading that this pattern is observed; when we look around at a scene, to 'take it all in', our eyes go into much the same saccade/fixation routine.)

A skilled reader clocks in at about 90 fixations for every 100 words read, depending, of course, on the difficulty or familiarity of the text itself. Each fixation, therefore, is covering a single word except that very familiar words may be skipped or fixated together with a neighbour and longer, less familiar or composite words (like saccade or fixation) may be fixated at two or more points or for longer than simpler words. Easier, or more familiar, text will require, and receive, fewer fixations. Harder, or less familiar, text will require, and receive, more fixations. More demanding reading will also produce a greater proportion of backward saccades and re-reading of words.

During a fixation the eye sees acutely over a five degree scan; in other words it sees more than simply the word it is fixated on. Interestingly, this scan is biased in a forward direction, that is we see about 2/3 to the right and 1/3 to the left of the word fixated. (An Arabic language reader, who reads, of course, from right to left, sees the opposite,

about 2/3 to the left and 1/3 to the right, when reading Arabic script.) Our eyes are obviously getting a sneak preview of the upcoming text. This will slightly reduce uncertainty and improve speed of decision-making.

When reading simple text aloud, if it is suddenly obliterated (e.g. if the lights go out) the reader is able to continue for a time, usually to the end of the current grammatical unit (clause, or even sentence). There is evidence that we fixate for longer, in fact, at grammatical boundaries (where there will be helpful punctuation marks) perhaps to allow the mind to digest and organise material before continuing. The eyes also, especially with easier reading, march ahead of the mind which is decoding and recoding to meaning.

So, we have eyes fixating on words yet able to see ahead by another couple of words or thereabouts, and perhaps running ahead of the mind's comprehension when reading simple text. This may allow the mind the chance of prediction, of marrying what has gone with what may be coming in order to eliminate unlikely hypotheses and suggest likely ones in advance of decision-making time, thereby reducing uncertainty and thereby increasing both accuracy and speed of the decision-making process. For example, hippopotami on the continent of Africa are said to kill more people than crocodiles do. Putting this completely irrelevant remark into this discussion of reading surprised you, I guess. If you did not suspect I was purposefully fooling around you would be jolted to a halt and have to look about in the text a bit before deciding it was a misprint, or I had gone off my head, and (perhaps) continuing. Read in the context of a discussion of the relative dangers of various forms of African wildlife, of course, that sentence about hippopotami excites no such shocking dislocation. It would, in that context, fit the hypothesis you had formed as to what was going on and inform and support your onward reading.

'Mistakes' and anxiety.



figure 4.3

Have you read the two items in figure 4.3? Did you notice that in the first the word 'the' is repeated and that in the second the word 'springtime' has lost its P? Most people do not notice either error and are, in the event, astounded to have it pointed out that they were there in the text at all.

In precisely the same way a literacy student, reading back his own sentence one marvellous evening for the 'feel' of it, produced, with absolutely perfect assurance, not once but twice: *"It took me years to pluck up the courage to come to the group"*. He was astonished to be warmly congratulated (much later) on having read, without a moment's hesitation or concern and without becoming aware of his 'error', the word '*courage*', twice, although the word he had actually written onto the page was '*nerve*' - an utterly different word, though with the same meaning in that context so fitting the reader's current hypothesis very well. (And see 'exploded text' in the notes to chapter seven.)

Such 'errors' are the result of intelligent, top-down processing; the result of prediction, of the formation of good hypotheses. The mind has made its decision based, in large part, on what ought to have been, or might well have been, or probably was on the page rather than on what was actually there in fact. These decisions are not, of course, 'errors' at all. They are an indication that the purpose of reading has been achieved - the meaning of text is being accessed without paying too slavish heed to the detail of the text itself. This is exactly what we are seeking; it is skilled reading. It is looking for meaning rather than at trivial detail.

A student reading 'courage' instead of 'nerve' in the right context without even noticing deserves a gold clock. They are demonstrating truly fluent reading. (Although the casual disregard for detail fluent readers demonstrate makes proof reading very difficult, of course, especially if the text is interesting! The fluent reader enjoying text will overlook, will simply not 'see', errors of detail which allow meaning still to be discerned.)

Life comes to us as an avalanche of details, mostly pretty well meaningless in themselves. Our minds, though, are meaning-making machines. We seek meaning everywhere. We screen everything which presents itself to us for its meaning and relevance. Much detail we ignore, or blank out as irrelevant. Literacy is no different. Text is just another, if rather particular, environmental stimulus, pointless unless meaning is found for it. Reading is just another example of finding meaning in the world. As part of our searching for meaning we are also organising and categorising creatures, continually seeking to meld detail into chunks of greater significance. We seek to manage meaningless detail by amalgamating it into meaning, easier and mentally cheaper to manage.

Students should be encouraged to read the largest possible unit (morpheme or word) rather than the smallest (the letter). They should seek to have as little to do with detail, such as individual letters, as is reasonably possible, just as you are doing right now. We are able to manage fuzzy data and to cope with fuzzy thinking. We must avoid making students over-anxious about precision and attention to detail. We must allow them to accept the making of 'errors' (where the meaning is not lost) as good practice rather than failure. We have to help them out of their visual and mental tunnel, into a fuzzier but broader environment where the sunshine of meaning illuminates and where the odd stumble is seen as an acceptable price for increased freedom, greater confidence, evolving autonomy, understanding and joy.

Chapter Five.

The background to spelling.

In which the reader explores the principles and history of spelling in English and looks at the other half of the lexicons & pathways map.

‘... English spelling is more abstract in its principles than a grapheme-phoneme correspondence system ...’

(Stubbs 1980 p. 43)

Hope! There are, allegedly, ‘principles’ underlying English spelling or, in the jargon, the English *orthographic system*. Perhaps English spelling should not cause so much excitement or despair? Maybe the language is not just a haphazard collection of irrational and infuriating irregularities? Are we wrong to express cynical amusement, or wounded rage, at the so-called ‘vagaries of English spelling’? Should we stop maligning our language? Michael Stubbs’ book *Language and Literacy* is the perfect antidote to such linguistic negativity, such orthographic abuse, and I recommend it. Much of what I am about to say comes by way of it.

Some background: The spelling of English is systematic and principled. Indeed it is. Stubbs uses the famous (and famously silly) notion from George Bernard Shaw who claimed that it would be possible, in English, to spell ‘fish’ as ‘*ghoti*’ - from, for example, enouGH, wOmen and naTion. (Shaw was promoting a phonically regularised spelling system which did not catch on. He made the fundamental error of assuming that text was, could be or should be a representation of sounds on paper.)

So incensed is Stubbs by this nonsense that he puts it on the front cover of my edition of his lovely book. As he vigorously points out, ‘*ghoti*’ is an absolutely illegal spelling of ‘fish’ (or, indeed, anything else) in English. Furthermore it is instantly recognisable as illegal. English orthography clearly dictates where and how particular letter patterns may be used to do particular things, and where they may not. It does this very consistently.

English spelling is not random, as '*ghoti*' was used to suggest. You cannot pick any letter pattern you come across and deposit it anywhere else you like. English orthography functions according to clear orthographic and historical principles. '*Ghoti*' is instantly recognisable to everyone literate in English as non-English, as an absolutely 'illegal' construction, precisely because it does not follow these principles. It is immediately recognised as not an English word, never mind one spelling 'fish'. '*Ghoti*' may be fun, but it is also fatuous.

The spelling of English is systematic. It also contains much non-phonetic detail which is useful to its users. Fluent readers have learned to 'read' this system and it helps. English orthography provides the fluent reader with a great deal of extra information, over and above the mere sounds of the language. This additional information relates to word and morpheme meanings, word relations and linguistic history. The reason English spelling has gained such a reputation for arbitrary complexity is that it is not, it must immediately be admitted, a system which is particularly helpful to the very early learner.

English spelling is not a system which merely relates letters to sounds. You cannot invariably and exactly read the sounds of English from its written form. Letters do not absolutely consistently correspond to sounds. In jargonese, it is not a pure *grapheme-phoneme correspondence* system, it is not a wholly *phonically transparent* system. (Not many languages are. English, being a more cosmopolitan language than most, is less transparent than many. It still retains a high degree of transparency, nonetheless. All is by no means phonically lost.)

English does not relate letters or letter patterns simply or directly to sounds at all times; it does not always represent sound absolutely precisely and consistently in orthographic characters (although, by the same token, it mostly does do exactly that). English spelling is better regarded as *morpho-phonemic* rather than *grapho-phonemic*. In other words it is more likely consistently to relate sounds to the *morphemes* of the language than to letters or letter patterns. (A morpheme is the smallest meaningful unit of language. *Small, est, mean, ing* and *ful* are all morphemes, for example.) All morphemes carry their own freight of meaning; and this is why they tend to be spelled consistently, irrespective of sound. Fluent readers read this morpho-phonemic consistency and use it.

It is misleading to think of English spelling in terms only of letters or letter patterns and the sounds they might indicate. We should remember that *text is meaning written down, not sound written down*. We must begin to think in terms of words and morphemes, the meaningful blocks of language, rather than letters or letter patterns. As we have seen, in earlier chapters, we do not have to identify every letter of every word, but may use larger units - morphemes and even whole words - and we are seeking meaning rather than identifying letters or seeing sounds. Our orthographic system does exactly this.

Of course English spelling is closely related to English sounds, but not slavishly so. Particularly where sound is predictable, the spelling system is free to abandon the absolute relationship between grapheme and phoneme, between letters and sounds, and is free to indicate a grammatical or historical point or a particular meaning instead. Fluent readers gain very considerably from this extra information, and early learners should be told this. An example might be the plural 's' ending. This is a hard and fast principle in English - (almost) all plurals are made with a final 's' regardless of the sound made. Houses (houziz), lads (ladz) or cats are not spelled purely phonetically precisely because the valuable information that all three are plural nouns would be lost if they were. The sounds are predictable and known, so spelling can be used to indicate other, and more useful, things to readers.

In this example, the spelling clearly and unambiguously indicates a meaning; a past tense verb form. This is profoundly useful. When we read 'talked' (or was it 'chatted'?) the fact that what we are dealing with is a past tense form of 'communicate verbally' is of greater importance in almost every context, as we have seen, than exactly which verb is being used. We may cheerfully substitute talked for chatted, for example, but we are much less likely to read *talking* in place of *chatted*. It might be catastrophic to the reading if we did. We may consider the exact word, or sound, insignificant but not the grammatical construction which underpins meaning - we read for meaning.

There is also, of course, the question of changing and various pronunciation. The sounds of languages vary over time and between places. Spelling, unless each period and every county is to be given radically different systems, self-evidently cannot cope with such variety by simple grapheme-phoneme correspondences. We are being naïve and parochial when we demand such a high degree of phonic regularity, especially from a written language of such cosmopolitan and sophisticated maturity as English, a language of a certain age and experience. Let us rather relax and enjoy its rich and

meaningful diversity, and all that history, carried visually down the centuries to us on those ancient patterns. Let us deliberately learn, rather than disparage, its secretly valuable subtleties.

A little history will help:

Modern English derives from all over the place. It stems from Old English (pre 1150), but has incorporated much from other languages as time has passed. After 1066, and for a couple of centuries or so, up at the posher end of things, if one was anyone, one spoke French. One spoke it at court, one even spoke it at home if one was anyone. One heard Latin in church. Were one to have schooling at all one had it in French and Latin. One read legal or religious documents in French or Latin. One probably read nothing at all in English. (One would have been pushed to find anything in English to read.) The people on the Clapham omnibus, or cart, however, went right on speaking English which was left free to develop in the mouths of ordinary people doing everyday things, to develop towards the practical, robust, colourful and flexible language we enjoy today, freely borrowing from other languages as and when.

Pronunciation was very different in those days and still hangs about in many spellings. The final 'e' in many words was, for example, actually pronounced - 'take' would have been something like 'taka'. French spellings crept into English words here and there - Old English 'cwen' became 'queen' for example. Pedantic Latin 'regularisation' also occurred. 'Honest', for example, got its 'h' (which has always been silent) from Latin Honos (honour), even though it actually reached English from Old French 'oneste'.

Becoming aware of such etymology, and its effect on spellings, can be helpful and interesting, or at least dissipate some of the usual ill feeling towards spelling. Eroding the belief that English spelling oddities are simply that, devoid of rhyme or reason, is a real service to students. Etymology, the derivation of words, certainly doesn't solve all spelling difficulties but it will solve many, explain others and fix some in the memory. For example capable is not 'capible' because it derives from the Latin 'capabilis'; possible is not 'possable' because it derives from the Latin 'possibilis'. You can hear the ancient Romans saying these words. Interesting, no?

Some forty per cent of modern English words are actually foreign imports; *loan words*.

Some Anglo-Saxon words have been displaced, but many remain. French and Latin words entered the language, and do so now, as does Greek in particular, as new technologies and new ideas crave linguistic expression. We have far greater choice of words today as a result. 'Bit', for example, is from 'bita' (old English), 'part' is from 'pars' (Latin) and 'piece' is from 'piece' (French). And we go on borrowing: 'yoghurt' is Turkish, 'taxi' is French, 'potato' is Spanish, 'ski' is Norwegian, 'pyjamas' is Urdu. Sometimes we invent new words altogether: 'Diesel' was a German engineer, 'petrol' (petroleum) is a hybrid of Latin & Greek: *petra* = rock (Latin), *oleum* = oil (Greek); and so is 'television': *tele* = far off (Greek) and *videre* = to see (Latin).

Our characteristic posture vis-a-vis English spelling tends to be exasperation, or even rage and despair. Considering derivations and families, connections and relationships, semantic or grammatical roles, can go some way towards alleviating such hypertensive and counter-productive emotions. It may also help to fix spellings in the mind and language in the heart. English is a language of quirky personality and much pleasure is to be had from learning a little of its ways. I always have a nice dictionary incorporating etymology to hand and use it whenever a student wants to spell, say, 'catastrophe', 'charisma', 'fascinate', 'malignancy', 'centigrade' or 'vinaigrette'. (And see an interesting consideration of the usefulness of English language history in the classroom by Invernezzi & Hayes 2004.)

Some principles of English spelling: A whirlwind spin through some of the principles of English spelling follows, remembering that we think morpheme rather than letter.

Most spellings are phonically regular, or very close.

All spellings give some information about pronunciation.

Those spellings which are phonically irregular are either idiosyncratic, with a one-off, often historical, explanation or are being spelled according to a different beat altogether - for example a syntactic or semantic beat.

For example 'catastrophes' is not spelled 'cattastrofiz' for two reasons - the 'ph' is idiosyncratic and historical (the word is Greek-derived) and the ending is 'es' because it is simply the plural 's' ending attached to catastrophe. All regular plurals, and most are regular, are s endings. This is all quite understandable. Likewise, the word 'many' is, apparently oddly, spelled with an 'a' but this is because it derives from Norse and Old

English 'manig' (and where English has -y endings Scandinavian languages (the Vikings spoke Old Norse) have -ig). This is also an idiosyncratic and historical explanation, but it helps - particularly if you go on to look up 'any' and find that it derives from Old English 'anig'. Before the 'great vowel shift' they were pronounced differently, of course. That 'a' would have been more phonically regular, then, not that anyone was much concerned at the time.

Words are often spelled in such a way as to indicate their grammatical role even, if necessary, at the expense of exact letter-sound correspondence.

The past tense marker '-ed' is a good example. Batted, bowled and watched end in the sounds 'id', 'd' and 't'. However, since they are all the same grammatical construct, similarly affecting their attached verbs, carrying the same *meaning*, they are spelled the same in order immediately to convey this extremely important information to the reader (who is presumed already to know how he will say the words, and does). The fluent reader instantly understands that a past tense is being represented; the speller has to learn, for the reader's sake, to produce it reliably. The reader can tell at a glance that 'feted' is the past tense of something while 'fetid' is not.

Words which seem phonically irregular in one form are very often phonically regular in another.

The classic example of this is all those '-sign' words of similar derivation with their silent 'g' - sign, resign, design, assign and so on. Much is sometimes made of their irregularity. However, they all have forms in which the 'g' is sounded – signal, resignation, designated, assignation and so on. There are many other examples: nation but native; stationary but static; optician but optical, clinician but clinical; permission but permissive; division but divisive. There is medicine, but medical and medicate, publicity but public. You will easily find many other examples.

Units (e.g. morphemes) which look the same probably mean the same, those which don't probably don't.

Units with related meanings or derivations share common spellings, and at least one of

these will probably be phonically regular. Sign and signal look the same and mean similar things whereas rode and road do not and do not, for example. This gives the reader information of such value that it is surely worth the sacrifice of a little phonic regularity.

‘Though this be madness, yet there is method in’t.’ (Hamlet, of course.)

Spelling reform:

Spelling ‘reform’ is still, spasmodically, being suggested. (Look on the internet for several passionate societies and some frankly mad ones.) ‘Reform’ invariably means phonic regularisation, turning English spelling into a more *transparent* phonological system where letter-sound correspondences are far more regular, less diverse and more predictable. This would make life easier for the absolute beginner learning to write, but a tremendous amount of value to everyone else would be lost in the process. We fluent readers, of course, are almost completely unaware just how much the spelling system helps us take meaning from text so easily and at such speed and just how many clues to meaning we would lose if our spelling were to be reorganised on purely phonetic principles.

What would we do about regional differences? If the spelling system is to be democratically regular, to be phonetically true everywhere and for everyone, then a Glaswegian will have to use a radically different writing system to the Prince of Wales, and both will have to use a different system to a Liverpudlian, or me - never mind the vast numbers of English speakers in other countries; what about the dog breeder from Dallas, the solicitor from Sydney, the judge from Jamaica, the barman from Bermuda, the physiotherapist from Fiji, the doctor from Delhi, the cricketer from Christchurch, the urologist from Utah, or the mechanic from Mombasa? If it is to be one single, phonically regular system, should it be yours, or theirs, or mine?

More importantly, large swathes of semantic and derivational/relational clues will disappear. Wee wud hav to rite notist, hawdid and plaset; ride hawsez on rodez and sale botes; rite sine but signl; medik and medikl but medikate with medisin; nativ but nashunal; wud and wud, cud, shud, doo and dun, way, way, wade and wade and soe on and soe on and soe on, mor or less indeffinnitly. Will this help fluent readers? If not, will

spelling be rendered sufficiently more immediately accessible to the very early learner to compensate?

Many linguists, Chomsky among them, consider that English spelling allows the fluent reader to home in on the meaning-bearing parts of text which really matter, to skip along sampling a minimal amount of the actual text. If this facility were to disappear we would be obliged to examine all of every word we read, something we don't do at present.

When we read we probably use a cascading, proactive and predictive, minimal cue, flexible, visual feature analysis system which certainly tends to consider units larger than letters regardless of their 'sound' - common patterns, morphemes or even whole words (common words, remember, are often the most phonically irregular of words). If these flexible and minimalist features were replaced with a one-dimensional phonically regular system, reading would be slower, and comprehension more difficult, for all but the very earliest readers.

The most compelling argument against reforming English spelling until it is phonically regular is that we don't read or spell primarily phonically in the first place. We don't access written language mainly through its sound. We read, and we spell, visually. Phonics is a secondary system used, when it is, as back-up to the visual system. Very early readers use a degree of phonic attack, but even very phonological readers, as they become fluent, wean themselves onto predominantly visual attack. (Goswami & Bryant 1990, Frank Smith 2004) Fluent literacy is visually mediated and English spelling is a visual system, signalling to a visual reader.

Wholesale reform might benefit the very early learner at the very beginning of the process, to an unknown degree, but it would seriously disadvantage the more fluent user. 'It is worth noting a healthy trend towards trying to understand our orthographic system instead of trying to reform it.' (Brazil 1982, cited in Peters 1985 p. 35).

And, from the little research I have done into this subject, it seems certain that spelling reformers would replace today's system with an equally authoritarian one, where a spelling was still either absolutely right or absolutely wrong. No reformer I have come across is anything other than authoritarian - they merely want to be authoritarian about

a different system to the one about which we are presently so authoritarian. Where people have a problem with literacy in English it is precisely with our authoritarian attitudes to the spelling thereof. Spelling terrifies and disables large numbers of people. This is iniquitous. It should not be. And it is not even spelling as such which so intimidates and incapacitates, it is the fear of spelling in public. The fear of discovery.

We live in a deeply 'spellist' society; we have extremely harsh, uncompromising, often frankly hostile attitudes to even slightly faulty spelling. We grotesquely over-react to inaccurate spelling. Public ridicule is an ever-present possibility to the weak speller. Spelling well is, quite wrongly, associated with intelligence. Weak spelling can be equated with stupidity, even personal worthlessness (ask any ABE student). Until recently you often heard the very word 'illiterate' used to mean 'thick' - perhaps you still can. To be uncertain how many 'm's there are in accommodation, or whether there are one or two 'h's in whether (and which weather it makes); not to know that vigour drops its 'u' in vigorous, and in the United States, is to risk ridicule. This is, itself, perfectly ridiculous.

It is time to stop; time to remove, or at least dilute, a cruel and unnecessary tyranny. Spelling is not clever, nor is it language. As linguistic skills go, it is easily the most trivial and unimportant.

If we really want to make a difference to the man on the bus or the woman in the office, if we really would like them to use their own language freely and with confidence, in their own way and for their own purposes, in their own writing, with pleasure and without fear, we ought to be much less fiercely demanding of spelling precision. We should stop being so po-faced and censorious. What a kindness that would be. What a collective sigh of relief would go up. What an immense, and instantaneous, educational advance that would be. Everyone would be linguistically enabled. The only cost would be the swallowing of pride by those self-important, self-righteous and usually self-appointed guardians of 'standards' we did not need in Shakespeare's time and do not need very much now.

Because the truth is that in the glory days of written English, when all sorts and conditions of people used their language with vigorous independence and obvious pleasure, you could spell pretty well how you liked - the dictionary had yet to be invented. (Samuel Johnson compiled almost the very first in the eighteenth century.) If

William Shakespeare were to apply for a job today, particularly to an English department to teach English, he would be turned down without interview solely on the basis of his 'badly' spelled application form. If he were to send a publisher a handwritten copy of Hamlet it would be binned, on the same grounds. Shakespeare's spelling, you see, was all over the place (by today's standards) - he even spelled his own name differently at different times. His queen, Elizabeth the first, was no different. She reportedly spelled the simple word 'but' no less than four different ways on a single page. Spelling obviously mattered very little to these highly literate, deeply intelligent people. Spelling was not 'right' or 'wrong'; it was simply whatever you wrote. 'Spelling' was, presumably, not a particularly meaningful idea. And yet there is no suggestion that they were not able to read what each other had written at least as easily as we do today.

There is obviously room for at least some relaxation in our predatory and jaundiced attitude to spelling. We don't need to reform a whole language, we simply need to unbend a little. And, of course, the attempt to corral, or fossilise, any language is perennially absurd, and always will be. The only linguistic constant is, and always will be, change. Language is, arguably, and in the case of our language I would claim demonstrably, much the better for exposure to the winds and currents of linguistic democracy. Were the pall of virulent spellism to be lifted, who knows what genius might flower and where it might next take our language? In the end:

Spelling is spelling, nothing more.

It isn't authorship and nor

Does it amount to writing, it

Isn't wisdom, truth or wit.

Writing that's beautiful, or true,

Has its influence on you

Not, for heaven's sake, because

Of how the bloody spelling was!

Some more cognitive psychology: Language management from meaning to speech or writing.

I hope I have persuaded you, in previous chapters, that we don't read primarily phonically. Reading is not done phonically in the first instance, though phonic back-up may be quite important for purposes other than simple word recognition. (eg Adams 1990, Ellis 1993, Smith 2004) We read simple text directly - visually - all the way to meaning. Biology is always economic - the most direct, and cheapest route will be the one taken.

Exactly similar arguments can be deployed to show that we also primarily spell directly - visually - taking the most direct route from meaning to text through visual symbol. We do not assemble phonemes then translate them into graphemes and take them to writing, we take language straight to graphemes from meaning. We do not take meaning, make it into sound, translate that into letters and write; we take meaning straight to letters (or even whole words and morphemes) and write them. What we are talking about here is the bottom half of the diagram we last met at figure 3.3 (the whole thing is at appendix one).

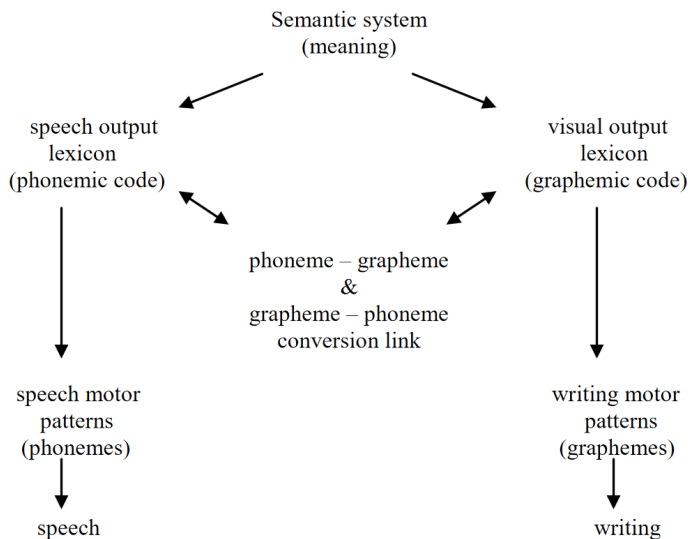


Figure 5.1 Producing speech or writing from meaning.

Language, held in semantic code, as meaning, in the semantic system, activates its *graphemic code* representation (its representation as visual symbol) in the *visual output lexicon* (a mental store of language as visual symbols). From there it may directly activate its *motor code* (its representation as instructions to the fingers to execute that symbol) and thence the muscles of writing themselves. This is the *direct*, visually mediated and most usual route. It is the way fluent spellers do the trick. (And it is the eyes which tell us when we have gone wrong. If it looks wrong, it is wrong. We operate a 'when in doubt, write it out' spellcheck, in fact, and we do this because we spell visually.)

Assembled spelling: There is, however, as there is with reading, an indirect route available. This can be used as a back-up system, a check-up system or when we wish to write new (or nonsense) words for which there can be no entry as yet in any lexicon. And we know we can find plausible candidate spellings for absolutely new, or nonsense, words, like 'malversation' or 'spinkleduff'. We are back at the idea of some sort of *grapheme-phoneme / phoneme-grapheme conversion link* as we proposed for reading by sound. Language can be assembled into phonemes, which can be converted into graphemes (or candidate letter patterns) and thence to writing as before. This is indirect, or *assembled*, spelling, though.

Such spelling by sound is, as phonically mediated reading is, a roundabout way to the goal. It is also, as assembled reading is, a commonly experienced secondary event, experienced as a result of inevitable spreading activation through the language systems. As a result, as our phonemic code representations are secondarily activated it can feel as if we are spelling by sound even though we are not.

Spelling by sound is optional; fluent spellers do it visually. Getting this right matters in the same way, and perhaps even more, than it does with reading. Students have a (sometimes unfortunate) tendency to listen to their tutors. If tutors advise that spelling is to be attacked through sound - as a phonic activity - there may be long-lasting results. Spelling (and reading perhaps) may forever be mediated indirectly, round the conversion links. Literacy may become, to the unfortunate student, exclusively a matter of turning sounds into letters and letters into sounds - 'a matter of sounding out'. The indirect, assembled routes may be the only ones ever consulted. Using these indirect pathways clearly makes the establishment of good links (in a word, learning) more difficult.

Such unnecessary complication, the insistence on such unnecessarily expensive procedure and the involvement of so many extra primary representations for each item, will produce the characteristically slow and patchy success that has been seen in so many literacy classes in the past. We will have trained the brain to do something of which we know little, in one particular way, and a way it would not have chosen if left to its own devices. Odd behaviours (often just like 'dyslexic' behaviours) will appear. We shall have turned a straightforward and direct psychological task into what was so often the definitive ABE experience; an apparently obscure, strangely complex, oddly difficult undertaking only fitfully illuminated by either real success or authentic understanding and almost never by genuine confidence or real autonomy.

Chapter six.

The meta-issue.

In which the reader considers our innate inability to take learning from here to there, novices and experts, and meta-thinking.

No essay, no dissertation and certainly no book on an educational theme is acceptable, today, without considerable reference to meta-this and meta-that. And quite right too. Whatever you're studying, the meta-issues really matter. For example, in this chapter I am going to fumble towards a theoretical consideration of meta-cognition, meta-linguistics and meta-affect. It seems to me there is still a long way to go before the meta-issues around literacy are elucidated; before we are clear what they really are, what their impact really is and how we may best manage them. This is at least partly because hardly anyone is giving such matters any real thought. We should.

Meta-issues are not yet an integral part either of our theory or of our practice. We appreciate meta-issues only rather tangentially and usually pass on timidly and swiftly, averting the gaze from such scary notions. We find them difficult to isolate theoretically, and so we find them difficult to consider. We do not therefore find meta-issues overtly informing our thought, our teaching or our learning, though we sometimes secretly suspect they may secretly be doing so. The influences of 'meta-literacy' issues are so subconsciously 'normal' to us fluent literates that they do not break into our teaching philosophy. The debate is not 'main-stream'. Meta-issues seem to remain below the conversational radar. They are of major practical importance, nonetheless, and should feature in our theoretical thinking more than they do.

It is my belief not only that we should make an effort to understand the meta-issues better ourselves, and hold them further forward in our own minds when thinking about literacy or teaching, but I also believe that our students should be explicitly enabled to understand and use the skills of meta-cognition, meta-affect, meta-linguistics and meta-praxis. I believe that this area of thinking is about to become very much more important, in educational theory and thereafter in teaching practice. I commend it to you, at any rate, and wish you luck therein.

Meta- (I looked it up) means (in this context) 'of a higher or second-order kind (*metalanguage*)' (The Concise Oxford Dictionary, 7th Edition, 1982) and 'Denoting a nature of a higher order or more fundamental kind, as *metalanguage*, *metatheory*' (the

New Shorter Oxford English Dictionary, 4th Edition, 1993). Textbooks commonly describe it as ‘thinking about thinking about’ something; ‘thought about thought’.

You will already have observed that I have reached a conclusion on at least one aspect of this subject - I shall place a hyphen between meta and the next word, even if my dictionaries suggest I should not. (Metalanguage and metaaffect look ridiculous.)

Problem-solving and meta-cognition:

I vividly remember the embarrassment and shock I felt when I first studied problem solving and the transference of learned skills from one situation to another. It was while taking an Open University module given by Hank Kahney, who also wrote a set book for the module. (Kahney 1986) It is an interesting text still. The human mind, it turns out, is astonishingly bad at transferring knowledge or skills learned in one situation to another, however similar, without pretty explicit instruction and advice. We don't, apparently, do it unless we are told to. Homo sapiens is, in the event, stunningly short on sapience when it comes to taking learning from one context into another.

Imagine we have been set two ‘isomorphic’ problems (problems with the same, or extremely similar, structure - the ‘Chinese tea ceremony’ and ‘Towers of Hanoi’ problems, for example). If the same problem is presented in a different context, with the same problem structure but transposed into a different situation, this new context will be enough to condemn us to experiencing roughly the same difficulty solving the problem on the second occasion as we did on the first, even if we have only very recently solved this first setting of the problem. Apparently we do not naturally, under everyday conditions, take any of the skill or knowledge we have gained from our solution of, say, the Chinese Tea Ceremony with us to the solving of the Towers of Hanoi. We take about the same time to solve the second problem, make much the same mistakes and go along much the same blind alleys, as we just did with the first. We are apparently so wrapped up in task specifics that we completely fail to notice very helpful, indeed absolutely fundamental generalities and similarities.

Of course, if we are specifically told that there is almost complete similarity between problems one and two we gratefully see this and are able to solve problem two without breaking sweat - but only if we are actually told that there are fundamental similarities between the problems. This is embarrassingly dumb, but apparently deeply human.

For example (and see Kahney 1986) we struggle to solve the ‘jealous husbands’ problem. (How do you get three husbands and three wives across town in a very small

taxi which holds only three, while preserving chaperones? No wife may be left with any men without her husband present. You know how husbands are.) After much mental effort we reach a solution. Hurrah! We take a coffee break. Then we are set the 'missionaries and cannibals' problem. (There are three cannibals and three missionaries on one side of a river. They have to get across this river but have only a very small canoe which holds only three. The cannibals must never outnumber the missionaries. You know how good missionaries taste.) Almost incredibly, we are hardly any better at the second problem, having solved the first, than we would have been if we had never seen either. We will struggle to almost exactly the same extent with another isomorphic problem after lunch (cats and canaries perhaps?) unless someone points out that there may be similarities in the structures and demands of these problems and specifically desires us to step back and consider the shape of these problems *per se*, instead of the immediate detail of possible moves.

We seem to be slow to realise that hard-won skills and knowledge may be generalisable; we have to be told deliberately to think about how to generalise learning and we have to be told to deliberately recall and apply learning elsewhere than where we initially did it. This extraordinarily embarrassing truth is very pertinent to the teacher.

The fact seems to be that we have to be told to learn, and then to seek to recall and employ, general (as opposed to specific) problem-solving skills when faced with problems. We need to be taught to consider problem solving *per se* and not solely focus on any particular problem in marvellous isolation. Thus it is with all learned skills - unless taught deliberately to seek and deploy them we don't. Learning to generalise newly learned skills, learning to deliberately seek and apply these skills, amounts to a meta-issue. This is learning about learning, thinking about thought, applying skills to the application of skills. It is meta-cognition, and it is a skill which can be learned.

To take a teacher's example (Amicie Thompson: personal communication 2001): A group of students have just learned about *genre*, and *critical reading* (Christie (in Littlefair 1994), Kress 1994, McCormack 1990, Millard 1997) as part of your drive to instil the habits of *critical language awareness* when reading text (Clark & Ivanic 1997, Fairclough 1992, Lankshear *et al* 1997, Luke 2000). The students have learned to use these meta-reading ideas in the context, say, of a piece of advertising copy. The message has clearly got across well. Critical reading and language awareness have been perfectly understood and enthusiastically and intelligently applied. Every student has understood and deployed these techniques well. Happiness all round. At their next class, a week later, however, you are disappointed to find that these approaches are not spontaneously applied by a single student when another piece of writing - a newspaper

article with an obvious agenda perhaps - is being considered by the group. You therefore remind them of it. There are widespread cries of happy recognition and critical reading is immediately applied again joyfully and cleverly to the new text.

Next week, however, as you feared, much the same happens. Thus it will, apparently, always be until we step right back and specifically teach the technique of overtly seeking, recalling and applying techniques. In this instance, until we teach that reading should involve the deliberate invocation of techniques like suspicious reading or critical language awareness *per se*. The importance of genre and how to read intelligently, with critical awareness of the ways language can be deployed to sway readers, are easily enough learned - the trick is to learn deliberately to look for, and then use, these tools whenever we read and not to plunge completely into text to the exclusion of such appropriately sceptical techniques.

The transfer of learning from one situation into another is not, apparently, an innate feature of human intelligence. Left to our own devices we don't do it well. It is clearly a rare skill. Let us not be downcast on that account, however; skills can be learned. The skills of thinking about language and its use - considering genre, bias, intent, style etc. - comprise meta-linguistics. Students must be taught these skills, and explicitly taught also to recall and deploy them.

In the psycho-jargon around problem-solving, we seem innately to consider only single moves or, at best, rather small clusters of moves. Apparently, we do not innately see, or even feel we could usefully think about, non-specific *problem structures* or *problem spaces* in general (Kahney 1986). Without prompting, we do not seem to consider the consideration of problems *per se*; we do not think about the construction of our problem and whether there may be clues to its solution there, as a matter of course. We do not naturally think about similar problems and whether there are any lessons to be taken from them - we plunge instantly into thinking about possible moves in the problem which is before us right now. It is to counteract this tendency that so many courses instruct us how to think about our subject in general terms rather than look at the facts within it. It is the difference between information and understanding.

We can usefully think in terms of *novices* and *experts* in this context. Initially, and in many circumstances, we are all novices, of course. Novices and experts have different amounts of subject knowledge, but they also *represent problems* completely differently. A novice instantly sets about solving a particular problem as soon as it is set. This, inevitably, means concentrating at once on detail, which, equally inevitably, means ignoring structure.

The novice immediately plunges into the wood and begins looking carefully and intently at and among trees. Not many trees can be seen at any one time and it is difficult to see any distance. There is a bewildering amount of detail, but not many clues as to the relevance, or otherwise, of any of it for him. The light is poor in there, and no path seems any more hopeful than any other. Some turn out not even to be real paths. The sense of direction is soon lost. Under such circumstances, the novice can only plan small strategems which will take him a short way, and hope for the best. It is seldom absolutely clear whether any path is really relevant to the ultimate goal. It is often necessary to retrace steps and abandon particular paths. Sometimes it is difficult to tell whether a path has been tried before or not. It is inevitably largely a trial and error approach. Our novice will quickly forget most relevant details of the problem and will soon lose the sense of the route he took to reach the solution upon which (let us hope) he may stumble. When he does, it will be almost completely accidentally.

While the novice is blundering speculatively back and to in the dark wood the expert has remained outside, thinking about problem structure, perhaps even walking away from the wood to some higher ground for a better overview. He will deliberately consider other woods he has been in, and the general and specific structures of problems they have posed. He will review his knowledge of woods in general and specifically. He will think about structure, but also about solution - what does he really want from addressing this particular wood and is it worth addressing? He may take time for a cup of tea and some peace of mind. He may look up information on his laptop which he foresees he will need. He will, in fact, deliberately employ meta-cognition. The expert may enter the wood in a while, but will then be concerned only with particularly meaningful trees, or patterns of trees, or topographical features, or alignment to the sun, or wind direction, or the tracks of particular animals ... The expert will have seen whether it is worth working in this wood at all and, if so, what to look for, why and where. He will only be looking for, and at, particular features and he will know what they all mean for him. There will be few surprises in there.

Our novice is stuck with very local trial and error searching - our expert understands. He understands the particular problem, but he also understands the generalities of this kind of problem. He recognises the probability that this wood is similar to other woods in important respects and the need to consider this deliberately. He will eventually proceed swiftly, and directly, to his goal and will very likely learn something which will be of value when he next has to enter a wood, particularly if he finds any part of the problem tricky. He will find the whole episode challenging and interesting. He will have noticed many salient features of the wood, because he knows which features are and which are not. He will be able to understand and remember interesting details of this particular wood and will be able to use these if a need arises in future. He will also

remember to remember them if it does.

Working in that wood as a novice, however, is enervating, oppressive and a little frightening. The novice may even feel humiliated and cowed. He will have only a rather general impression of the wood. He will notice and recall very few important details, and little of what he recalls will make much sense. Almost none of it will be memorable, or remembered. Once out in the daylight, his wish to experience other woods, and his confidence in his ability to handle a wood-related situation, is likely to be small. Perhaps we do not believe, as Ronald Reagan once remarked, that once you've seen one tree you've seen them all, but it begins to feel exactly like this. Woods have probably come to seem rather belittling, even hostile environments. His opinion of himself has probably fallen. As a woodsman it certainly will have. The longer it takes him to solve this wood, the more his negative responses (to this wood and woods in general) will predominate.

As Simon says 'The human information-processing system is capable of, and willing to endure, very little trial and error search' (1985 p. 259). One major difference, therefore, between the novice and the expert, is that the one will soon run out of steam and become frustrated and even perhaps actually averse; the other will remain interested, especially if he feels he has been challenged. Novices risk demotivation the more difficulty they encounter; experts become ever more motivated by it. (And see an interesting article by Yau (2005) examining the reading behaviours and attitudes of an expert and a novice reader.)

Meta-cognition is important in ABE, but not, of course, only in ABE. According to Raban & Lewis (in Wray & Medwell 1994 p.184) it is '... closely associated with learning.' They describe it as follows: 'Metacognition encompasses thinking about one's own learning processes as well as the ability to act on that information.' They describe four ways in which it may be taught, including meta-cognitive explanation and scaffolded instruction. Education should be about the meta-issue as well as the acquisition of skill and knowledge, and scaffolded instruction in thinking can, and should, begin at any age.

Meta-cognition includes learning to understand learning. For example, students need to become overtly and consciously familiar with the methods they use to learn: Why they use them, how they work, why they work, when to apply them and how to apply them. They need to be trained deliberately and consciously to think about their work at this level. To that end their tuition must be transparent and any and every query about it answered in full.

When learning a spelling, for example, students need to be in a position confidently to

consider how it may be learned. They must have readily to hand different methods by which it may be learned and be able to consider these and select relevant method to suit. If it is a common pattern, is it best learned with other words & through LCWC / SOS? If so, should someone be drafted in to help find other examples of words containing the pattern? Is it a complex word which can usefully be unpacked into root and morphemes, or is it a word which may repay a dictionary investigation, looking for history and considering relationships? Is it worth thinking about which bits are the difficult ones and which are already understood spellings? Is it possible to think of a mnemonic to remember the spelling by? Are there links with other words which may be used to remember this one? And so on. It's a matter of ownership - it's their learning and they must own it, clearly, democratically and openly, and at the meta-level.

Meta-linguistics is the higher-order understanding of language. It includes the overt recognition that language is always a tool, sometimes a weapon, and is routinely used to influence the world in particular ways chosen by the author. Meta-linguistics insists upon overt recognition of exactly this whenever text is to be read. Who wrote it, and why? Who is it really for? How is language being deployed? Why so? How is it being used to influence readers; to do particular things with (or to) readers?

You and I understand that language is a tool - that it is used to do particular, not always wise, true or friendly, things, to others. We know that we examine much writing critically, even suspiciously. What, we often cry, is the author's game? Who is the author, anyway? Is there an agenda and, if so, what is it? Is it benign? Who is it targeting? Why so? Our students are not necessarily thus programmed, nor can they easily be so confidently sceptical. They should be. They need to understand that writing comes in many forms or genres, each with its own highly particular ambition. Writing is always situated and it always has a purpose. It may be innocent purpose, but it may be malign. Students must understand that they may, indeed must, read various texts variously, depending on author and circumstance - that reading is also situated and has purpose, that reading is a critically active process. They need to understand that they may legitimately skim, scan or skip, read lightly or with close attention, read every word or search only for particular items, they may read innocently, critically or downright suspiciously, according to the genre of the writing they are reading and the suspected intent of the author.

Students need to know that they need to know all this, and that they need deliberately to apply this knowledge to every reading. They need to learn effective reading, which is, of course, another way of saying that, in respect of reading, they must be critically empowered.

Understanding meta-cognition and the need for meta-cognition, is a major step towards what remains our goal - autonomous and confident competence. We not only need meta-cognition as such, we also need to know that we need it - and we need to be told this (and told it rather often). We need to be told that there are broad principles and general approaches which structure and colour detail, and we need to be told that we must deliberately seek and consider these before we get bogged down in this detail. Experts do this. They may have expensive specialist knowledge but, every bit as importantly, they have also been trained to step back and meta-think rather than plunge hotly into detail and get slowly frazzled there. Experts operate among principles and broad categories, after which detail is simply detail. They are trained to find the structure and isolate the relevant, which demands general understanding and the deliberate application of general understanding. They had, though, to be trained to do this; it is no more 'natural', no more an innate skill, for them than it is for a novice. Indeed, not very long ago our expert was a novice. All is, in other words, not lost.

Teaching meta-cognition, or any other meta-skill, demands the deliberate deployment of two venerable teaching methods. Both are fundamental, especially in the literacy classroom. One is *scaffolding* and the other is *modelling*. To scaffold learning, teachers must make explicit, and go on making explicit, the frameworks of meta-cognition and the need deliberately to build and then invoke them - the need to step backwards; to reach peace of mind; to engender confidence in one's own abilities, experience and common sense and to deploy these; to take a deliberately wide, overall view; to invoke general theory; to consider related issues; to recall similar instances and compare them with present issues; to think generally about situational structure; to critique the present and particular presentation of issues; to consider an author's putative purpose and read in the light of it and so on and so on. The need deliberately to do such general, proactive, critical and enquiring thinking about thinking or reading must be made explicit repeatedly - as we have seen, these are not innate mental habits and do not transfer well into new situations.

To model critical awareness when reading students need to see it in action. It must be made obvious that the teacher actually uses such meta-cognition in real life, that it is a genuinely useful, and used, set of techniques. Where a problem or issue is addressed the teacher must demonstrate her thinking aloud, must show how she uses meta-techniques herself when addressing issues or solving problems. Critical reading would be a perfect opportunity for such modelling. As a reading is approached and carried out a teacher can actively model the meta-linguistic questions and ideas she keeps actively running in her mind before and while reading. She can provide a commentary of her thinking. She can overtly show that she routinely interrogates text at the meta-linguistic level and is alert to agenda, immediate purpose and wider ambition.

Meta-affect: Meta-thinking can be applied to our affective lives, too: To our emotional responses, our attitudes and expectations and our motivations. Students in ABE often have searing histories of savage personal trauma experienced through the very public humiliation of failure to 'catch' literacy, in school and at home, day after day, from a tiny age and over many years. The pain of inability to master the educational system's first, and apparently lowest, hurdle is greater than you might think. Once secondary school is reached, enrolment in the remedial class may also have been a deeply bitter experience. Students use strong and purple words like 'the remo's', 'thick', 'hopeless', 'stupid', 'boring', 'total demoralisation', 'despair', 'completely pointless', 'absolutely impossible', 'humiliation' and even 'terror' when talking about their past experiences of literacy, tests and school in general. 'Bunking off', or even less appropriate behaviour, may have been their response. Such a student's painful feelings of incompetence and worthlessness, or worse, can be palpable in the ABE environment half a lifetime later.

Coming back to education, and literacy, can lead a student, sometimes without warning, up intense and noisome emotional blind alleys where further increments of self-esteem may be lost and confidence may be further shredded. Grown-up people, bus drivers, check-out ladies, welders, parents, may suddenly weep. Such hurtful recollections may be destructive; this is, though, not inevitable and they can even point a way towards progress.

A student who has learned to understand something of how and why literacy may affect him emotionally, who understands something of his history and where his dark responses arise from and who understands something of how to manage such emotional reactions, becomes more the manager, and less the victim, of literacy. This understanding and adaptation of attitude and response may be addressed quite independently of the acquisition of the literacy skills themselves. This is meta-affect and can, in some instances, be as important as any other aspect of literacy tuition. It is a matter of becoming aware of potential emotional traps, their probable origin, what triggers precipitate emotional responses and some technique for managing them when they detonate.

I think it is reasonable to suggest that almost every adult literacy student failed to achieve fluent literacy right at the beginning of the process. At this point they were between the ages of nought and, say, eight. This is far too young to accept blame; it is one of those rare instances where it really is everyone else's fault. This issue can be explored productively, if care is taken, in written work. Considering their history from a new, adult perspective helps to lift some of the preposterous guilt from many students. Exploring their literacy history can also be the start of understanding meta-affect;

becoming more emotionally aware and better equipped. As this new perspective develops literacy tends to become less overpowering. Its capacity to cripple with rage or disable with fear will reduce. The balance will tilt in favour of the student, who will become less a passive and intimidated victim and more an empowered and adult learner. Literacy can begin to be seen as a tool rather than an accusation and lack of fluency in it as a problem rather than an indictment.

A controlled exploration of these more realistic perspectives should be deliberately offered to any student who seems intimidated, enraged, anxious or depressed by their condition.

The goal is always confident autonomy and empowerment. Students may, of course, begin to feel anger, once they discard some of their guilt, as the true origins of their literacy difficulties emerge. This anger may be profound, but it is truer, and healthier, than the appalling guilt which is so common among students, and if it be focused onto their learning it can be a fiery propellant.

Students can set unrealistic standards, and have unrealistic expectations. They often imagine that fluently literate people never get anything wrong; that they invariably write perfectly at the first attempt. Such misapprehensions mean that an error of their own tends to loom large and to confirm their own feelings of ineptitude. The student may feel there is a wider chasm between their condition and that of a fluent literate (for example, their probably rather passionately literate tutor) than there really is. Strongly destructive feelings may abruptly develop. These feelings are usually baseless but they are no less painfully disabling for that. Indeed, baseless feelings are often the worst of all, as we all know. Panic and/or self-disgust may well up, blocking appropriate, or even adult, response. Belief may drain away, and take ability and motivation with it. This tends to confirm, of course, panic and self-disgust. We may suddenly have an evil spiral on our hands.

The only antidote is meta-affect. Students need to understand how difficult writing is and how we all find it so; that literacy is a continuum on which we are all struggling to improve, and that none of us is really satisfied with our own efforts. Writing, with its attendant meta-linguistic thinking, may be modelled. In this process errors should be openly made, admitted, corrected and discussed. The notion of error-free tutors who write perfectly must be enthusiastically eroded. We must also erode students' distaste for, and fear of, error. Errors are extremely valuable. They are highly personal, targeted feedback, a perfect source of raw material for writing and spelling tuition. They enable us to learn the skill of autonomous writing. Mistakes are highly desirable. They just need to be dealt with in reasonable and regulated doses. (Not every error needs to be

either pointed out or dealt with immediately. If it's important, or common, it will reappear.) All this must be made clear to students right from the start. (And see notes to chapter seven.)

It is a truism that the only person who makes no errors is the person who does nothing. It is also a truism that nothing can be achieved without action. To act is to risk, and inevitably produce, occasional error. Error, though, is where learning begins, in literacy and in life. Error ought to be precious to us as a result. All students urgently need to know that every writer produces errors all the time. Teachers in ABE must, to this end, make all theirs right out in the open. All writing of any importance goes through several drafts, the best writing goes through the most. It really must be made clear to students that we all inch forward over a trail of error and failure and we all use the delete key and waste paper basket assiduously. The clearer, simpler and more lively the writing, the more likely this is to be true. Writing is work, and not work which succeeds easily. As Samuel Johnson said: 'What is written without effort is in general read without pleasure', and in the words of J.K. Galbraith, that scintillating performer on the English language:

“First I produce a draft and then I leave it alone for a day or two. Then I go back to it and decide that it has been written by an ignoramus, so I throw it away. Then I produce a second draft and leave it alone for a few days. I read it and decide that there are the germs of a few good ideas there but it is so badly written that it is not worth keeping, so I throw it away. After a few days I write the third draft. I leave it alone for a while and when I read it again I discover that the ideas are developing, that there is some coherence to my arguments and that the grammar is not too bad. I correct this draft, change paragraphs around, insert new thoughts, remove overlapping passages and begin to feel quite pleased with myself. After a few days I read through this fourth draft, make final corrections and hand over the fifth draft to the typist. At that stage, I find I have usually achieved the degree of spontaneity for which I have been striving.

(I deeply apologise, to you and Professor Galbraith both, for not having a reference for this quote.)

Meta-knowledge is not innate, it must be taught. Part of meta-knowledge is the knowledge that we should seek and use meta-knowledge. This meta-awareness is apparently not natural. Embarrassingly, it has to be taught. Part of being meta-aware is the awareness of the value of meta-awareness itself and that its techniques should be deliberately recalled and applied.

We seek to produce the student who chooses appropriately among a selection of learning, self-correcting and self-management methods and the student who can take a strategic overview of his performance and attitudes towards his performance. Like the student who came up with the mnemonic 'FRIday is the END of the week when you can go for a drink with FRIENDs'. Or the student who had a problem writing 'accommodation' [at the hotel], began to get depressed and mad, then considered his reaction, smiled to himself and wrote 'rooms' instead. Or the other student who deliberately imagines the two 'm's in accommodation romping naughtily in the same hotel bed and thereafter has no problem with the word. Or the student who you find has looked up 'revolution' and found, to his interest, 'revolve' and 'revolutionary'. Or the student who writes that 'I've found some of the ways we work can help my lad just as well'. Or the student who turns up with three drafts of a piece of writing which get more focused and better written as they go. There are words written several different ways on the drafts, with the wrong spellings scored out. He has also retained the drafts without embarrassment. Or the student who sings out 'What we really need to think about is what the bloke who wrote this article is up to; where's he coming from?' Or the student who says 'I wrote it this way because ...' Or the student who, until recently crouched protectively over his work, now pushes some of his writing over and says 'Is that how you spell president?' Or the student who says 'Whoah! This is too heavy all at once. Give it to me bit by bit!'

These students are engaged in their own literacy, and their own learning. They see it from outside as well as inside. They have the tools for tackling new situations; they have the understanding to look into their toolbox appropriately - and that they must do this. They are drivers rather than passengers.

Chapter seven.

Literacy & affect.

In which the reader considers the effect of affect on learning and performance, as well as the causes and consequences of learned helplessness.

‘... more stupid by every day ...’ (in Goleman *et al* 1984 p. 47)

To those of us who read fluently literacy seems such a straightforward activity, as natural as breathing and as much a part of us as the parts of our own bodies. It is as effortless as walking and talking. It seems correspondingly ridiculous that anyone should have real difficulty with something so fundamental, so simple as reading and writing appear to be. Hence the temptation to assume a *deficit* explanation - how else to explain away such an apparently weird failing?

This chapter reviews some literature and opinion on *affect* and in particular how it may influence literacy acquisition and performance. It considers *attribution theory* and *learned helplessness* both in general and in specific relation to deficit theories, chief among these being, of course, ‘dyslexia’ (a critique of which awaits in chapter eight). Teaching beliefs and their effect on learning are considered in the light of these. Some alternative explanations to deficit theories are discussed, as are some alternative remedial approaches which circumvent the ‘pathology’ inherent in these theories.

Whatever the subject, there is always an elephant among us which we all agree not to notice. For example: In the debate on education we propose everything except a really large increase in investment in it. We worry loudly about climate change on the wide-bodied jet to Bali. We demonise benefit fraud but ignore tax avoidance. We claim our excessive girth is hormonal, while eating a large portion of death-by-chocolate. Thus it is with literacy failure - we scrutinise the victim’s biology for defects but leave more disturbing, more complex influences on his literacy to slumber on. One such influence is *affect*. In this chapter I am therefore going to discuss the causes and effects of affect, a complex of social and personal influences on literacy and learning, and, as usual, I will do this with adult students in my mind. These students were schoolchildren once, though, and their experiences are a clearly written signpost.

Let us wrench our attention away from those so enticing, and apparently so scientific, *alibi explanations* for poor literacy which so conveniently and comfortingly lay the

blame on the victim of it. What might we begin to see? I think that foremost in the state of mind of most adult students (indeed a large number of adults not in our classrooms) is a substantial degree of *anxiety* in respect of literacy.

There is a great deal of evidence scattered throughout the literature (but left there disregarded) that the effect of *affect* on the learning and performance of literacy is a great deal more important than we have recognised (e.g. Andreassen *et al* 2006 and especially Ramirez *et al* 2019 – the first researchers to recognise ‘reading anxiety’, at last; a phenomenon which is absolutely ubiquitous, very common and obviously important – although I wish they had called it ‘literacy anxiety’, which is what it is).

Anxiety, more generally, is frequently and clearly recognised (e.g. Everatt & Brannan 1996). It is everywhere noted that failing to acquire literacy is associated with searing anxiety all round. This anxiety is routinely portrayed as the result of failure, but no evidence is produced to back this assertion. We always describe anxiety as the cart, but it could just as easily be the horse. Anxiety could just as easily be a primary cause of failure rather than its result. It could, at least beyond the very initial stages of literacy failure, be prior to, rather than consequent upon, this failure. This is an unresolved, but absolutely fundamental issue. It is another elephant going unnoticed, often, it seems to me, almost wilfully. Let us notice it clearly now.

I looked up ‘*affect*’ in the Shorter Oxford English Dictionary (1993) and found the following: ‘An emotion or mood.’ For ‘*anxiety*’, the same authority gives the following: ‘Uneasiness, concern; a morbid state of excessive or unrealistic uneasiness or dread. (med.) A condition of stress accompanied by precordial tightness or discomfort.’

It is interesting that the dictionary recognises that there does not have to be very much reality behind the ‘morbid state’, indeed that it is usually ‘excessive or unrealistic’, and that the medically defined condition may be quite disabling, even dangerous. (And see Horsman, 2000 and Van der Kolk *et al* 1996 for a review of serious trauma and its overwhelming effects on mind. The trauma I am discussing is of a lesser, more everyday order but the chains of causation and effect are likely to be rather similar.)

How could we have perceptions or emotions which were ‘excessive or unrealistic’? We can, and do, because our higher mental functions, in particular our consciousness, have no direct contact with ‘reality’ (whatever that might be). (For a discussion of consciousness and unconsciousness and their importance, or otherwise, in education, see notes to chapter six.)

What we have in our heads is, and can only ever be, a *virtual reality*. We invent it. We

can only experience 'reality' through many layers of unconscious activity; through the activities of a plethora of perceptions and lower mental 'organs'. 'Reality', as experienced in our consciousness, is filtered through prior unconscious processes. Everything is constructed for and by 'us', in our unconscious, during this process; everything from what we will decide to perceive to what we will construe from what we decided to perceive and what we will decide to do next. Even (perhaps particularly) our emotions, attitudes and motivations, our 'affective states', are thus constructed.

Our emotions profoundly affect our higher mental activities, and are affected by them in return. Our 'affective states' are, of course, based in part at least on whatever is happening to and around us. They are, though, also partly constructed from (or at least much affected by) our past history and affective experiences. They are constructed by the brain in a continual, reverberating dialogue between 'higher' cortical thought and 'lower' emotional responses and affective states. Being constructs based upon constructs, they may also be faulty; they may even be complete nonsense. (Ramachandran & Blakeslee 1998, Sacks 1985, Wall 1999)

Arnold (1999 p. 1) writes that *'Affect will be considered broadly as aspects of emotion, feeling, mood or attitude which condition behaviour.'* She immediately makes the important connection, a connection which we know that our brains make all the time, between our moods, emotions, feelings and attitudes and our behaviour. It has long been neuroanatomically known that *'... brain mechanisms involved in the processing of emotion have extensive interconnections with cortical areas that subserve higher cognitive processes.'* (Niedenthal & Halberstadt 1995 p.25) Eich says that *'... cognitive researchers ... regard emotions with respect, owing to their potent and predictable effects on tasks as diverse as episodic recall, word recognition and risk assessment.'* (Eich *et al* 2000 p.2).

We recognise, both intuitively and empirically, that our emotions powerfully affect our thinking, and this is confirmed by brain architecture. Affect and cognition are copiously and intimately interconnected. Vygotsky (1986 p. 10) says that the *'... separation [of intellect and affect] as subjects of study is a major weakness of modern psychology ...'* Niedenthal & Halberstadt (1995 p 26) suggest that our emotions may be the *'... organising nodes in memory.'* (And see Power & Dalgleish 1997)

Goleman (1996) describes this intimate interconnectedness between limbic system and neocortex, and thus between affect and reason, as *'... the hub of the battles or cooperative treaties struck between heart and head, thought and feeling.'* (*ibid.* p.27) On the same page he begins his description of *'... the power of emotion to disrupt thinking itself.'* (He even calls his book *'Emotional intelligence: Why it can matter more*

than IQ'). Damasio (1994) goes even further. Starting with an examination of the case of the unfortunate Phineas Gage, famous throughout psychology, who simultaneously blew away his prefrontal cortex, his soul and his humanity (as Damasio claims) in a horrendous accident with a tamping iron, he makes the case that this intimate interconnectedness of limbic and cortical systems makes for such total interdependence of emotion and rationality, affect and cognition, that:

... emotions and feelings can cause havoc in the processes of reasoning under certain circumstances. Traditional wisdom has told us that they can and recent investigations of the normal reasoning process also reveal the potentially harmful influence of emotional biases. It is thus even more surprising and novel that the *absence* of emotion and feeling is no less damaging, no less capable of compromising the rationality that makes us distinctively human and allows us to decide in consonance with a sense of personal future, social convention and moral principle. (ibid. p. xiv)

What we are, a little loosely, calling 'the emotions' have profound effects on cognition and cognitive behaviour. Emotions affect performance. They affect performance *in* (e.g. learning, enjoyment) and they affect performance *out* (e.g. skills, behaviour). Their effect, of course, may be positive or negative.

A major vehicle for their effect is motivation - itself a complex of history, educational experience and affect. For example, those of us who have had an educational career of consistent and loudly recognised literacy success will approach reading or writing tasks with confidence, enthusiasm and anticipation of enjoyment. Our self-opinion and expectations, at least in this regard, will be high. We are likely, in such a positive emotional environment, to succeed further. We are likely to surmount difficulty (which we are likely to experience as invigorating and interesting challenge) and continue to succeed. This success, especially if somewhat against the odds, will bolster our confidence and enthusiasm, further stoking our expectation that we can succeed again in the future and our determination to do this. If we fail we may attribute this to the complexity of the text - for example, we may confidently consider the writing to have been poor. We will not attribute failure to personal inadequacy. Task difficulty will positively attract us. We will, in a word, be motivated by literacy.

How different it would be for us, though, if we swam in a different affective ambience - one brought about by consistent and publicly obvious failure at literacy, the first, and apparently lowest, academic fence; society's educational baseline. We would, in such dismal circumstances, be unlikely to be drawn to literacy tasks. We would expect to fail. When we did fail we would attribute this to our own ineptitude. We would lack the

confidence to judge text, especially to judge it adversely. Our self-esteem, at least in respect of literacy, would be low and easily eroded even further. Difficulties would actively oppress and repel us. We would be intimidated, depressed and humiliated by literacy; we would be demotivated. (And see Jones 1991, Pflaum & Bishop 2004, Ramirez *et al* 2019, Riddick *et al* 1999, Sainsbury & Schagen 2004, Strommen & Mates 2004, Triplet 2004, Twist *et al* 2004, Wang & Guthrie 2004, Waterland 1994)

Riddick *et al* (1999 p. 241) write that:

In the literature on school-aged children the strongest relationship is between poor reading performance and low self-concept or self-esteem; this has been found to be independent of general ability and therefore indicates the powerful mediating effects of literacy performance on how individuals perceive themselves and are perceived by others.

And vice versa, let us loudly note. For many people, of course, their school years delivered exactly such consistent literacy failure and exactly such negative perceptions of them by others. This was public humiliation indeed, experienced among and before the victim's immediate and closest peers and significant others, day upon day upon day. The powerfully and intimately negative emotional environment thus engendered around literacy may last for decades - ask any adult literacy student.

Leichter (in Goleman *et al* 1984 p.47) quotes one as saying '... some kids used to freeze ... you'd go blank and you'd get slaughtered again ... [the kids who couldn't read] ...got beat more than anybody ... they got more stupid by every day.' In the words of Judy Wallis (in Mace 1995 p.61) this may be a result of classroom literacy being '... reduced to a set of booby traps designed to expose the unwary writer to ridicule and contempt.' I recall (and so can you, probably) tough boys who dominated the playground being reduced to tears of excoriating humiliation and rage in the classroom when failing at the task of reading aloud to their peers. Miles and Varma (1995) quote adult 'dyslexics' reminiscing as follows:

'There was a terror campaign waged against me to get me to spell properly.' and 'while I was at school I was educated to feel shame and worthlessness, to feel doubt in my own abilities and self-hatred. I was educated to feel small and worthless.' (ibid. p. 65)

Arnold (1999 p. 89) quotes a study claiming that '... on average children receive 460 negative or critical comments a day and merely 75 positive ones.' Pumfrey and Reason (1991) quote a case study of 'dyslexic' boys carried out in 1990. This study speaks of

their 'emotional reactions' to their '... extremely adverse experiences of education.' thus:

... they are reported as having experienced ... violence; unfair treatment/discrimination; inadequate help and humiliation ... emotional reactions included truancy, psychosomatic pains, isolation, alienation from peers, failure of communication within the family, lack of confidence, self-doubt and denigration, competitiveness disorders, sensitivity to criticism and behaviour problems. The case studies reveal in clinical detail the pressures and the pains experienced. (ibid. p. 65)

Some or all of this will be the likely experience not just of the boy with the 'diagnosis' of 'dyslexia' but of any child who fails at literacy acquisition, of course. (It is not clear, or not to me at any rate, that failing at literacy is any harder with than without such a diagnosis. Indeed, received wisdom claims exactly the reverse, that the diagnosis is, at least in certain respects, supportive. It protects, to a degree, from social opprobrium.) As the wonderful, if disturbing, John Holt points out (1982 p.37) when discussing a little girl and '... her 'reading problem' - which was mostly the fear that she really *couldn't* learn to read and the shame she would feel if this proved to be so' there is an affective minefield around literacy acquisition *per se*.

Nor is the child alone. Intense emotions may also be aroused in peers, parents and pedagogues as they become increasingly, and increasingly obviously, exercised by literacy failure. This will be felt, and powerfully internalised, by the victim, of course. As Young and Tyre write (1983 p.3) 'Past, present and future are all put in doubt when a child fails to learn to read. For the parent, rightly and inevitably, the problem is charged with anxiety and emotion.' Leichter (in Goleman *et al* 1984 p.46) says that '... parental anxiety with respect to children's literacy is omnipresent' and that 'The emotional reactions of parents can affect the child's progress significantly.' Miles & Varma (1995) note the same effect and claim that '... highly anxious parents are prone to panic ... once panic sets in ... the student can do very little.'

Ostler (1999 p.21) introduces the 'fussy mother'. This lady is driven by some or all of the following: anxiety, frustration, anger, guilt, distress. This is powerful, and powerfully negative, language. The chapter from which these last are taken demonstrates their dire effects but not all, of course, are likely to remain exclusively the problem of the fussy mother. The pressure on her child is likely to be enormous, and may be very personally threatening and undermining. Powerfully negative language may equally be applied to the child.

When such pressure is put on a mind, it will react in educationally important ways, of course. It will endeavour to protect itself and may evince some strange behaviours in the attempt. Many of these behaviours may be considered to be 'symptoms' of a deficit or abnormality. Some will be felt to be evidence of personal inadequacy (typically 'laziness') or even of wickedness. We should be on our guard and must earnestly remember that 'common things are common'. Emotional trauma is common. Failure at literacy is a very particular, and emotionally charged, trauma. It is peculiarly painful for everyone concerned but it is especially intimately, fundamentally and personally damaging for the tiny victim of it.

This is all strong stuff, and adults are not immune to it. Adult students, indeed, often announce with chilling certainty that they are 'thick'. Examples of low self-esteem, at least in respect of literacy, abound. One student, for example, for his first sentence at the very beginning of his very first piece of writing in ABE (adult basic education), wrote 'This will all be a load of rubbish.' Jennifer Rogers (1987 p.33) writes about: '... one of the most striking features of adult students; their anxiety that they might be making themselves look foolish or that they might be exposing themselves to failure.' (And she is not discussing ABE at this point - the 'adult students' in question were ordinarily successful people, many of them highly educated professionals, attending evening classes in subjects ranging from languages to carpentry.)

Fisher *et al* (1996) claim that there is a '... complex, curvilinear relationship between anxiety, arousal and task performance' in that moderate anxiety, or stress, may improve arousal and so performance, whereas high levels will reduce performance. The degree of anxiety experienced will, of course, be closely related to the likelihood, or perceived likelihood, of failure. This, in turn, is related to the degree, or perceived degree, of literacy expertise or otherwise. A person with weak skills will feel at greater risk of failure and experience more anxiety as a result.

Everatt & Brannan (1996), working with adult 'dyslexics', found that 'The fear of failure, and the anxiety this fear produces, in one task carries over into subsequent tasks and leads to a reduction in performance in those subsequent tasks.'. This effect will, of course, compound over time. It is also not going to be exclusive to 'dyslexics'. Arnold (1999 p.8) claims that 'Anxiety is quite possibly the affective factor that most obstructs the learning process.' and, on page 9, that 'Anxiety makes us nervous and afraid and thus contributes to poor performance; this in turn creates more anxiety and even worse performance.' Fisher *et al* (1996) state that '... children with LD [learning difficulties] are more anxious than their NLD [no learning difficulties] peers and their anxiety interferes with some kinds of performance.'

Pumfrey and Reason (1991 p. 68) caution against too readily accepting conclusions which may be '... too melodramatic ...' but they also write that 'Recent British cognitive research into specific learning difficulties (dyslexia) seems remarkably devoid of mention of social and emotive factors.' (ibid. p. 66). (In the third volume of the handbook of reading research (Kamil *et al* 2000) affect is conspicuous by its almost complete absence.) Johnston (1985) says that

Until we can integrate the depth of human feeling and thinking into our understanding of reading difficulties we will have only a shadow of an explanation of the problem and ill-directed attempts at solution. (ibid.p. 175)

Riddick *et al* (1999) review relevant literature. They find that '... performance is impaired by high anxiety' and specifically that '... working memory is particularly affected by anxiety'. Interestingly they find that:

... two trends emerge ... One is that cognitive and functional difficulties persist into adult life but that the negative emotional concomitants reduce considerably once individuals have left the competitive and high literacy demands of the school environment. The other is that adults in higher education, because they are still in a competitive and high-literacy-demand situation, still report a number of negative feelings. (ibid.p.232).

Johnston (1985 p. 167) writes that '... the effect of anxiety in reading difficulty cannot be over-estimated, although its circular causal properties are difficult to demonstrate.' He suggests, in this rich and fascinating paper, that faced with a task where failure is possible there are two distinct personal goals which may conflict. The apparently primary goal may be to complete the task or solve the problem. However, another, and possibly much more fundamental, goal may rather be '... to protect or enhance one's ego.' (ibid. p. 172). Arnold (1999 p. 12-13) quotes Canfield & Wells describing the 'poker chip' theory of learning thus:

The student who has had a good deal of success in the past will be likely to risk success again; if he should fail his self-concept can 'afford it'. A student with a history predominated by failure will be reluctant to risk failure again. His depleted self-concept cannot afford it ...

Arnold writes (1995 p.12) that 'self-esteem is especially significant in young children and has been shown to predict ... reading ability better than IQ.' It is, at least in my opinion, reasonable to doubt whether adults are very much less susceptible than are children to the corrosive effects of reduced self-esteem and consequent anxiety. As Judy

Wallis notes: '... if you walk into any ABE class you will find people oppressed by feelings of powerlessness, dependency and low self-esteem.' (in Mace 1995 p.61)

Johnston (1985 p. 168) claims that initial failure easily to acquire literacy may cause '... a very severe form of anxiety' and that there may, as a result, be '... a general avoidance of print detail and a shutting down of processing under stress' which 'could produce a condition of almost literal word blindness' (ibid. p. 169 and remember Frank Smith's tunnel vision condition), but that '... while anxiety seems very important, at least as important are the causes to which these individuals attribute their failure.' Johnston describes such attribution as causing 'helpless' and 'passive' behaviour, such behaviour being '... probably the most detrimental to learning.' Chan (1994) says that:

The issue of motivation is particularly critical for students with learning difficulties because of the learned helplessness problem associated with repeated failures ... these students are unlikely to try alternative ways of solving a problem when encountering difficulties ... believing there is nothing *they themselves* can do in such situations.
(1994 p. 320) (her emphasis).

In 1996 Chan also refers to '... maladaptive attributional beliefs ... leading to feelings of helplessness' and '... maladaptive behaviour.' Peterson *et al* (1993 p. 252) state simply that 'Helpless children are those who attribute failure to their lack of ability ... reading difficulties entail learned helplessness.'

Here we are, then, thrown inevitably up onto the stony shores of *learned helplessness*.

What do I mean by this? My description of learned helplessness, for present purposes, is as follows: Learned helplessness is an unconsciously mediated mental state characterised to a greater or lesser degree by some or all of the following: reduced confidence and self-esteem, impoverished performance, diminished expectation, lowered motivation, dampened curiosity, lack of engagement, weak persistence and passivity. In the educational context it may be induced by *maladaptive attributions*. (Bar-Tal 1984, Butkowsky & Willows 1980, Peterson *et al* 1993.)

Maladaptive attributions are a strikingly obvious phenomenon among ABE students, who regularly attribute their poor literacy performance to personal and innate failings such as, for example, stupidity, and to these personal defects only. They attribute failure to their irremediable inability or inabilities - lack of intelligence commonly, or a mental disability such as 'dyslexia'. Such attributions are, of course, helpful neither to learning nor to performance. However, the situation, at least in my opinion, is rather worse than

this; it is slowly becoming clear that maladaptive attributions and their attendant learned helplessness are more than just unhelpful; they may actually be disabling.

We need to look briefly, therefore, into *attribution theory*.

We are all psychologists now. We all know that it is our unconscious which drafts our perceptions, our beliefs and our behaviours. What seems to us to be truth is a construct of our unconscious mind, much affected during its construction by our limbic systems and affect. We function in a virtual world, a construct assembled in and by our unconscious. Constructs, though, are constructs. They are not real, but merely representations of 'reality'. Usually they are accurate (or at least seem to work well) but sometimes they are inaccurate, and sometimes they are highly inaccurate. Our perceptions of 'reality' are, in other words, sometimes plain 'wrong' and may even be flamboyantly so.

It is in our unconscious, which is much affected by our affective state, that our perceptions of the reasons for our own performance are constructed, for example our beliefs about the reasons for our success or failure at literacy acquisition. These are our all-important *attributions*. They are, though, mental constructs - they may be false. They may also be *maladaptive*. (*Adaptive* is a term from biology. Something which is adaptive supports an organism, for example in surviving, prospering and so, ultimately, in reproducing; something which is maladaptive does precisely the reverse, undermining, enervating and debilitating.)

Attributions have three axes, according to Weiner (1980): Internal or external; stable or unstable; controllable or uncontrollable.

Are the causes of, say, literacy failure perceived as inherent to the student or as arising from circumstance? Literacy ability can be seen as internal (an innate personal property) or external (the quality of parenting or teaching, for example).

Are the causes stable or unstable? (Mental ability is seen as relatively stable, for example, whereas the ability to ski is not - take lessons and you improve.)

And are the causes controllable or not? (Effort, for example, is generally controllable, whereas available educational provision may not be.)

And our attributions, however real or unreal they may be, have consequences. Attributing literacy performance, for example, to an internal, unstable but controllable cause (like not putting in the effort) will have a radically different effect on subsequent

motivation and performance than will attributing it to an internal, stable and uncontrollable cause (an innate deficit like 'dyslexia', for example). This is inevitable. It is also insidious; seldom consciously understood.

... pupils who tend to attribute success to internal, mainly stable and controllable causes and who attribute failure to internal-unstable-controllable causes, tend to exhibit adaptive, mastery-oriented behaviour. That is they tend to approach rather than avoid achievement tasks, tend to persist in the face of failure and tend to perform achievement tasks with greater intensity. Pupils who tend to attribute success to external causes and failure to internal-stable-uncontrollable causes show a very different pattern. These pupils tend to exhibit maladaptive, helpless achievement behaviour. That is they tend to avoid achievement tasks, tend to give up in the face of failure and do not perform achievement tasks with great intensity.
(Bar-Tal 1980 p. 211.)

I have already confessed my inability to tackle hardcore statistical theory with any joy or belief. (Can you learn that stuff from books?) This is at least partly learned helplessness induced by an irrational emotional response to considerable failure. Intellectually, of course, I believe my brain is perfectly capable of basic statistical theory but that is because I have confidence in the normality of my own intellect - many adult literacy students are less certain.

I recently also became aware of this same emotionally mediated effect when reading about the reading wars in a chapter of a major text. What I read was full of monsters like 'conceptual relativism', 'epistemic relativism', 'critical fallibilism', 'coherentist' and 'constructivist' (the last two apparently being the same creature!). I realised that I was dealing with the argument much less well than I expected (was drowning, in fact) and that this was because I was powerfully intimidated by the terminological monsters. I was reduced from confident master of literacy into anxious victim of a species of illiteracy. My intellect told me (when I used it) that the problem was the writer's over-egging of the jargon, but my emotions told me, quite loudly, that I was personally inept. I began attributing considerable incompetence to my own literacy and intellect. I failed to attribute any of my difficulty to the unnecessarily arcane language. My attributions were maladaptive and my reading behaviour was fundamentally altered while reading this section. My eyes slid around the page almost uncontrollably. I could not hold them to the work for any length of time. In the end I had to read the passage aloud, and even then skip a good deal of it.

I have recovered now, but then I am an extremely confident literate (under normal

conditions). Reading must often be this traumatic, and difficult, however, for less literate people.

Interestingly, it turns out that mathematicians have long recognised the debilitating condition they call 'mathematics anxiety' (and see Ramirez *et al* 2018). The literature on this subject goes all the way back to the 1970s and beyond. They recognise the powerfully negative effect mathematics anxiety has on learning and performance. They recognise that this condition is affect-dependent; that affect is likely to be as important as knowledge to performance and is fundamental to the acquisition of information and understanding. Evans suggests (2000 p. 44) that this anxiety depends on four foundations: confidence (including self-concept, perceived self-efficacy and locus of control as described by Weiner's three axes above), the perceived usefulness of the subject, the perceived difficulty of the subject and the degree to which the subject was felt to be interesting or enjoyable. All these influences interact in complex ways in different people under different circumstances and their combined effect can be malign and long-lasting. This all reads, to me, like a clear description of 'literacy anxiety', a syndrome which clearly exists and is obviously important but has only just been recognised (Ramirez *et al* 2019).

Learned helplessness is everywhere. Let me show you how exactly the same effect of inappropriate attribution delivering learned helplessness can operate in almost any field of performance in which you care to look. Recent work on their genes among volunteers who smoke has shown that certain patterns of enzyme production are much more typical of addictive smokers - smokers who find particular difficulty in giving up. These enzyme production patterns are genetically determined. Some smokers, in other words, are genetically predisposed to find it much harder to 'kick the habit'. While this research into their genes was going on the subjects of it were indeed trying to stop smoking. Those with the gene likely to make this more problematic were told about their predisposition.

Some of the people with the duff gene, it was noticed, made heavier weather of giving up cigarettes than did others with exactly the same gene. On investigation it was found that what seemed to make the difference was precisely their different attributions of the cause of their difficulty. Some, despite knowing their genetic predisposition, nonetheless attributed their difficulty mainly to external and controllable factors - they were in social situations like pubs and parties a lot, for example, and felt the need to smoke there. This group, although they found it hard, tended to persist in their efforts to stop smoking and, in the event, achieved considerable success.

Others with the same genetic makeup had different attributions, however. This group

took the information about their gene to heart. They made radically different attributions, considering that their particular difficulty in giving up smoking was due entirely to their genetic makeup. In other words they attributed their problem to an internal, unalterable cause - their own genes; a personal, and unalterable, failing. This group was less persistent in their efforts to stop smoking and actually achieved a lower success rate. Their circumstances were similar, but their attributions were different - and these attributions were maladaptive. These people felt they could do little themselves to affect outcome. They had, simply as a result of being told about their genes, acquired learned helplessness in respect of tobacco.

I am quoting in full an anecdote from Peterson *et al* (1993) to demonstrate how easily learned helplessness can be induced and how powerful it is. In this instance (a nursing home) the effect is brought about through the induction of a state of perceived powerlessness; in the educational context the effect is induced mostly through maladaptive attribution. The effect, however induced, will be the same.

On its two floors the Arden House Nursing Home had about 100 patients in residence. Their average age was eighty. Two psychologists decided to introduce some additional good things to this particular nursing home: movies and decorative plants. At a meeting on the first floor the director told the patients:

I was surprised to learn that many of you don't realise the influence you have over your lives here. It's your life and you can make of it what you want. You made the decisions before you came here and you should be making them now. I want to take this opportunity to give each of you a present from Arden House. [Plants are passed round and each patient chooses one.] The plants are yours to keep and take care of as you like. One last thing; I wanted to tell you that we're showing a movie two nights a week, Thursday and Friday. You should decide which night you'd like to go.

On the second floor the patients were given the same things, under crucially different circumstances. Here's what the director told them:

I was surprised to learn that many of you don't know about the things that are available to you. We feel that it's our responsibility to make this a home of which you can be proud, and we want to do all we can to help you. I want to take this opportunity to give each of you a present from Arden House. [Each patient is handed a plant by a nurse.] The plants are yours to keep. The nurses will water and care for them for you. One last thing; I wanted to tell you that we're showing a movie two nights a week, Thursday and Friday. We'll tell you

later on which day you're scheduled to see it.

The patients on the first floor had control over these new events in their lives whereas those on the second floor, who were given the same things, had no such control. The residents on the first floor became more active, had higher morale and were less depressed. Eighteen months later they were also more likely still to be alive.

(Peterson *et al* 1993 p. 6)

We are closing in on the mechanics of learned helplessness. This profoundly intimidating, enervating and demotivating condition afflicts just about everybody to some extent in some areas of their life, of course. We can all think of something we dread having to do, something at which we 'know' we are incompetent and are therefore sure we will do badly. Mostly we are able to finesse circumstances such as to avoid an unmasking. An ABE student, however, is inevitably expected to perform occasionally in public, usually cold, in that area of their life which holds genuine fear and real doubt. ABE students have the greatest difficulty seizing literacy bulls by the horns or even the tails. Literacy, at least in circumstances where finesse is impossible - and these circumstances may well include their experience of tuition - makes many students minds either stop or go to pieces. Their troubled and complex response is the direct result of previous experiences associated with literacy. Literacy engenders helpless behaviour. This behaviour has been learned. It is learned helplessness. As Butkowsky & Willows said (1980 p. 408):

... poor readers displayed characteristics indicative of learned helplessness and low self-concepts of ability. These included significantly lower initial estimates of success, less persistence, attribution of failures to lack of ability and of success to factors beyond personal control, and greater decrements in expectancy of success following failure.

It is not, of course, by any means only students who exhibit learned helplessness. Teachers, like everyone else, may have irrational expectations and attributions and so may affect students' attributions. Teachers' beliefs, and attributions, particularly about their students but also about learning itself and the likelihood, character and consequences of learning difficulties, will affect their teaching practice. (Agne *et al* 1994, Fang 1996, Jordan *et al* 1993, Westwood 1995) Muthukrishna & Borkowski (1995 p. 444) say that '... motivational goals and cognitive skills develop in a reciprocal fashion' and '... it is possible to influence motivational goals and beliefs...'. Bar-Tal says simply that '... teachers greatly influence pupils' use of causes to explain their successes or failures.' (Barnes *et al* p. 211) Fang (1995 p.51) claims that '... teachers who believe that

all children can learn will promote literacy development while those who believe that lack of ability is a stable state will produce a debilitating environment.' Johnston (1985 p.170) writes that

Teachers treat less able students quite differently from more able students and, in doing so, tell the less able students that they are constitutionally less able. This attribution of failure to a cause for which there is little hope of a cure is profoundly unmotivating.

Westwood (1995) usefully reviews recent research and thinking.

Teachers' actions and reactions ... are greatly informed by what they believe about the characteristics of their students, the nature of learning and the causes of learning difficulty ... If teachers expect that a student with a learning problem ... will be unable to do certain things, or will always achieve poorly, there is a danger that they will treat the student in ways which make that assumption come true. The negative impact that this 'self-fulfilling prophecy' can have on students' learning outcomes has been recognised for many years. (eg Rosenthal & Jacobson 1968) However, negative expectancy is not an easy factor for teachers to bring under their voluntary control, and therefore it still influences the way some students with special needs are treated. (ibid.p. 19)

Jordan *et al* (1993) discuss teachers' beliefs and the fundamental effect they have upon teaching methods. They claim that teachers are either 'traditional' or 'alternative'. Traditional teachers, they claim, believe that a problem is inherent to the student and that a pathology, a diagnosis, should be sought. Teaching will be narrowed to fit the diagnosis, and expectations will fall, in the face of pathology. Alternative teachers, in contrast, believe the problem is external to the student - they believe it is likely to be the inevitable fallout from the complex environmental and interpersonal interactions inherent in living. Their teaching approach will centre on student problems and abilities rather than on a 'deficit'. No pathology will be sought.

Johnston (1985) similarly describes teachers as falling either into 'processing deficit' models or 'alternative models' depending on the characteristics they attribute to students. The former attribute students with 'characteristics which are resistant to education', the latter with 'characteristics which potentially can be changed with education'.

Westwood's research (Westwood 1995) shows that some 75 per cent of teachers' belief systems fit the traditional, rather than alternative, model, claiming that '... teachers still

attribute most learning problems to factors within the student' (ibid.p. 20) He also says (ibid.p. 19) that

While at times some forms of differential treatment are highly appropriate for such students [those with learning difficulties], and actually reflect an attempt to adapt instruction to their special needs, problems do arise when the treatment is influenced by *false assumptions* concerning the students' potential for learning. (My emphasis)

For those who tend to seek pathology (and dyslexia comes seductively to mind, of course) Westwood offers many common, everyday and plausible alternative explanations for learning difficulties and many hopeful suggestions as to how these may, in general terms, be overcome. So does Johnston (1985) and so does Chan (1994 & 1996). Westwood (1995) claims that '... the deficit model is alive and well' and also that 'The belief that most learning problems can be blamed upon the student militates strongly against the student's best interests.' (ibid.p. 21) He goes on to quote Ginsburg, saying that 'The most effective strategy for dealing with learning problems is to improve the quality of instruction.' (ibid.p. 21). Vivienne Smith (2004) writes a devastating account of teacher & pupil disempowerment germane to this debate.

Some general categories of alternative explanations suggested by Westwood, explanations not invoking pathology or deficit, are: 'an extremely inefficient approach to learning' including a lack of 'appropriate teaching methods or the selection of unsuitable curriculum content'; the likelihood that, for some students, '... the actual content of the program does not match their existing cognitive skills, is not real to them or is not relevant to their needs'. He suggests that '... instruction in meta-cognition, explicit training in task-approach strategies and the teaching of self-instruction and self-monitoring' have produced promising results (ibid.p. 20).

Chan (1994 & 1996) demonstrates the important effects of meta-cognition and the '... close relationship between motivation and strategic learning proposed in recent meta-cognitive theories' (Chan 1994 p. 319). Johnston (1985 p. 174) says that:

Rather than the neurological and processing deficit explanations currently in vogue, we need to consider more seriously explanations which stress combinations of anxiety, attributions, maladaptive strategies, inaccurate or non-existent concepts about aspects of reading and a huge variety of motivational factors.

Chan (1994) says that students may '... not know *how* to try harder'. She concludes that

'One potentially effective technique is to combine ... an attribution retraining program with cognitive strategy training', that attributional retraining will '... promote functional motivational orientations' and that '... apart from teaching students the use of cognitive strategies for learning, teachers should also try to convince students that their learning successes or failures are attributable to the use of effective or ineffective strategies.' (ibid. p. 337)

A student's reputation may go before them. An assessment of a student may arrive with, or ahead of, the student. Such an assessment will - it is inevitable - alter the perceptions and expectations of, and consequently attitudes towards and approaches to, the student.

An early, if ethically notorious, demonstration of this effect was 'Pygmalion in the Classroom' (Rosenthal & Jacobson 1968). These researchers simply doctored infant school reports. Randomly selected children had glowing reports written for them, identifying them as 'bloomers' (gifted children, with high-flying potential). These 'bloomers' went on, over long periods, to better than expected success in school. This must have been due simply to the perception of them by their subsequent teachers, who had read their excellent reports. The perception of these children as specially gifted must have resulted in very different attitudes towards, and different pedagogical approaches to, the children fortunate enough to have had their records thus falsified. Indeed, when directly questioned teachers did report more positive experience with, and higher expectations, of these 'bloomers'. This strong effect has been confirmed in less ethically controversial research since 'Pygmalion'.

Perceptions - of student and teacher - obviously matter. They are, though, let us remember, constructs. Being constructs they are fallible. We are at risk of making those 'false assumptions' described by Westwood. I think we probably make many such. Particularly when informed, with apparent authority, that a particular student is very clever indeed, or rather slow, or perhaps that they are 'dyslexic', it is impossible not to form a prejudice. A psychologically well-informed saint might keep an open and positive mind, but a busy teacher may not always reach sainthood. A teacher who absorbs, however unconsciously, a diagnosis of a student's innate low ability (not to mention an actual disability like 'dyslexia') will form a prejudice to match. However unconsciously, and however genuinely undesired, this will manifest itself in teaching approach, expectations and attitude. (Kerr 1999, 2001 [b] & notes to chapter eight.) It will also, however unconsciously, communicate itself to the student. A degree of learned helplessness, in fact, will arise, and it will do this in all parties.

Nobody is perfect, not even you and me. It can safely, indeed it must, be assumed that

our perceptions are a patchy lot. Some may be true, more or less, some will be more positive than the truth and some more negative. However 'rational' we try to be, this will always be the way of it and it will always affect the way we feel and behave. We will only rarely be conscious of much, or even any, of this. Is all lost, then, in a malodorous miasma of emotional and psychological surge and backlash? I think not.

Managing affect:

I am ever more certain that the impact of affect, of the emotions, on performance, especially on literacy performance is very substantial. Positive experience empowers and enables; the phrase from strength to strength comes to mind. Negative experience, however, even in moderate amount, is frankly traumatic. Such trauma inevitably has lasting consequences, all of them deeply inimical to learning. These can be subsumed, rather generally speaking, under one or other of the umbrella terms learned helplessness or anxiety. Antidotes include success and meta-cognitive and attributional training, but affect itself can also be specifically managed.

Affect is much disregarded in the debate about where literacy difficulty comes from. Affect is regularly, and most sympathetically, mentioned as a sorry side-effect of literacy difficulty. It is, though, surprisingly and strikingly under-, or dis-, regarded as a possible cause of this difficulty and has barely been studied in its own right, in this context. It is interesting to speculate why this might be. Are we unconsciously protecting some *status quo*? Is it too scary? Too problematic? Too personal? Might it shift our focus onto embarrassing explanations and inconvenient conclusions? Or is it too mundane and everyday, too easily understood by the man on the Clapham omnibus perhaps? Does it fail to raise the scientific heart-rate enough, or to demand sufficient, and sufficiently esoteric, jargon to excite academic ambition?

At any rate, although the theoretical base of our discussion may thus be admitted to be a little threadbare and under-examined there is useful theory to be found and there are helpful thoughts to be had, nonetheless, here and there.

First, let us rather briefly consider what we mean, or perhaps more what we intend, by 'literacy'. What kind of thing is literacy? Is it a neutral thing, no more meaningful in itself than a blank computer screen is? Is it a non-partisan thing which will leave a participant essentially unchanged? The redoubtable Hannah More did not think so. 'I allow of no writing for the poor. My object is not to make them fanatics, but to train up the lower classes in habits of industry and piety.' (Hannon 1995 p. 14) This remarkable idea is brought bang up to date in Levine (1986 p. 146) when he asks whether literacy is '... a desirable attribute in unskilled employees because it is a convenient indicator for

employers of 'trainability' on the one hand and a 'schooled' (that is compliant) workforce on the other.'

Street (1993) asks whether literacy is 'ideological' or 'autonomous' (by which he means a 'neutral technology')? He says, to the contrary, that '... literacy is saturated with ideology.' (1993 p.9) and that it is '... a social process in which particular socially constructed technologies are used within particular institutional frameworks for specific social purposes.' (1984 p. 97). In Maybin (1994 p. 139) he concludes that an 'ideological model' of literacy '... recognises a multiplicity of literacies; that the meaning and uses of literacy practices are always associated with relations of power and ideology, they are not simply neutral technologies.'

Literacy is also always *for* something - we do not (except perhaps in the most meaningless educational settings) 'do' literacy in a vacuum, or for its own sake. In real life we always do something *with* literacy, the something, rather than the literacy, being the point. If students do not, at least partly as a result of our efforts, use literacy increasingly autonomously, vigorously and for their own purposes then we have left them with their '...intelligence but little developed' and with '... words without ideas, and ideas without words' (Vincent 1989 p. 92). Literacy is a personally empowering tool or it is nothing at all.

Next let us be as clear as possible about our own positions. Let us hope that nobody in ABE today regards it as '... fieldwork among primitives' who constitute '... an imaginary tribe, hopelessly deprived and impossibly different from the literate' (Levine 1986 p. 97). Let us further hope that none of us would remark, as did the Archbishop of Canterbury in 1991 that the inner city riots that year were due to '... a matrix of illiteracy, delinquency and other wrongdoing' or, as a 'leading British politician' said, 'there was not a high level of literacy so people were excitable and easily led astray.' (both quoted in Barton 1994 p. 14).

The most powerful antidote to the emotional ravages of prolonged negative educational experiences is early and ongoing positive ones, in a word *success*. Technical competence and confident autonomy. Dealing with negative affect as effectively as is possible in the circumstances, insofar as it threatens the learning of literacy, may very well be a part of our strategy but the learning of literacy skills is what we are really about. Failure, and the expectation of failure, must be replaced by success and the expectation of success. Confidence, the big one, will inevitably follow. (Charnley & Jones 1981, Du Vivier 1992)

Notwithstanding the above sentiments, the technical transfer of skills is not quite all we

ought to be about. Margaret Donaldson (1987 p.97) says that

Once the teaching of reading is begun, the manner in which it is taught may be of far-reaching significance ... the process of becoming literate can have marked - but commonly unsuspected - effects on the growth of the mind. It can do this by encouraging highly important forms of intellectual self-awareness and self-control.

And returning briefly to the debate on the wider meaning, to an individual, of literacy, we begin to see that even the process of its acquisition is shot through with important ideological implications. Learning literacy can, and therefore should, also be an inspiring mix of expanding the mind while simultaneously bringing it under personal direction. Our responsibilities may be great, but so are our opportunities.

A third theoretical strand is *androgogy*. Students in ABE are, by definition, adult. This offers some very particular advantages. Another of those words with which to impress dinner guests or frighten the dog, *androgogy* is the teaching of adults, as opposed to pedagogy, the teaching of children. (Greek: agogos = guide; paidos = boy; andros = man. The sexism is not mine.) Martin (1986) provides a concise account of Martin Knowles' theory of androgogy. The rigour of his theorising is debated but even so it remains useful formal background thinking about 'basic ed.' perhaps rather more than other 'ed.'

According to Knowles there are four outstanding differences between adults and children in an educational setting. Adults, he says, have a stronger and more independent self-concept, greater life experience, a more palpable desire that learning be immediately relevant to life outside the classroom and a wish to learn which is motivated by maturely perceived needs arising from the above-mentioned life. In short, adults have a better idea who they are, what they want and why they want it. Adults in ABE are not usually motivated by fear, compulsion or duty. Adults in ABE want learning to be problem-centred (rather than subject-centred) because they are prompted by events in real life. They want, for example, to learn 'better spelling' - a rather specified problem - rather than 'literacy' as such. ABE students are not, generally, interested (at least to begin with) in the more esoteric fascinations of literacy.

Adult students seek immediately practical techniques to deal with immediately experienced needs. Few can be expected to have much affection or desire for 'education' as such. How could it be otherwise?

'Scholars have come, in process of time, to love the instrument better than the end; not

the luxury which the difficulty encloses, but the difficulty ... not what may be read in Greek, but Greek itself.' (Smith 1809 p. 192) What good teaching must be about, in these older (and much better) words, is passionately to teach 'the luxury which the difficulty encloses' and not the difficulty itself.

I shall deal with my own 'take' on managing affect in ABE with the above theories in mind.

First comes *ownership and autonomy*. We have decided that many, probably most, ABE students will be suffering at least some degree of learned helplessness and/or anxiety. The tuition situation itself may well make them feel even more threatened, incompetent and dumb. They urgently need to experience some personal power - to begin, and early, to own and control their own learning and literacy. They urgently need to begin as soon as ever possible to manage both, consciously and for themselves. This may not always be easy. Many students are, after their own educational mauling, thoroughly unused to the idea that they might have either the right or the ability to take, or to use, any such power. It may take time, and often demands a surprising amount of effort, courage and trust from a student, but developing confident autonomy in respect of literacy practices is easily the most important change we can help to bring about. Passivity and timidity must be turned into confidence and autonomy. Confidence is the all-important foundation. Literacy depends utterly upon it - it simply cannot be built at all until confidence is laid. (And see Charnley & Jones 1981 & Du Vivier 1992.)

Knowles insists that a 'climate of adulthood' be deliberately engendered and assiduously maintained. By this he means that adults must be involved - must participate consciously and fully - from the very start and consistently thereafter in whatever involves them. They must be fully party to assessment of their own literacy needs, planning their own learning, their own learning strategies and procedures and the evaluation of same. Literacy tuition has to take place within a genuinely transparent democracy. Students need to have, and to know that they have, full voting rights. This implies that students be maturely informed. This, in turn, demands genuine understanding of what is taking place and why. It also demands thinking skills. It demands meta-cognition.

For the tutor this implies two things: first we have to understand ourselves as fully as possible. Why are we involved in ABE at all? What, exactly, are our approaches and orientations, our philosophies and methodologies? We have to be quite clear about why we do what we do, about our own theoretical fundamentals. Secondly, we have to be overtly clear about all this - we have to draw students into this knowledge such that they are also clear about the how and why. Students must be, and feel, empowered

within a democracy. They must understand and trust the system, which must be transparent.

So much of being an ABE student is psychologically, and/or socially, risky. It is risky to turn up at all. It is also testing - it is not at all clear what will be done, by whom, to whom, with whom and how. There will, though, probably be rather public engagement with exactly those activities which it has been so urgently necessary to avoid for so long, for very solid social and psychological reasons. ABE is psychologically risky, but if learning is to happen risks must be willingly taken. For this to happen, for students to attend and to volunteer input at all, a genuine atmosphere of positive confidence, success, discretion, honesty, reliability and trust must predominate. A genuine atmosphere cannot, of course, be simulated but it can, and must, be cultivated and demonstrated.

It boils down to providing good method which is well understood and defensible; to making clear what is taking place, why and how; to giving unconditional permission to question and debate; to encouraging input and creativity; to enabling experiment; to allowing, even encouraging, mistakes; to making it possible autonomously to learn from these mistakes, and finally to getting out of the students' way when learning is going on. This last is especially obviously necessary when it comes to learning literacy, which is a 'doing' skill *par excellence*. It really is impossible to teach literacy, only to learn it. The learning is in the doing; the doing is the learning. We have to enable and facilitate that.

We have dealt with ownership of learning and literacy. Now we consider *techniques and autonomy*. It seems to me to be essential to conceptualise 'literacy' as three distinct components - *writing, reading and spelling*, from the very beginning.

Learning the concrete skills of literacy is easier if it is broken into separate and distinct activities. What we do, cognitively and affectively speaking, when engaged in each of these is quite distinct from what we do when engaged in either of the others. Learning within and about each activity is simpler if they are separately envisaged and learning is approached through the deployment of distinct, and well understood, sets of techniques specifically appropriate to each activity (and see notes to this chapter).

The mind focuses better, and understanding, internalisation and transference seem to happen more securely, when addressing a small, well defined subject area (like 'spelling') rather than a larger and less well defined one (like 'literacy'). The better we understand precisely what is to be studied, the more rapidly it can be learned and the more securely it can be made our own.

Writing, for example, is more easily mastered by a student if it is made quite clear that we approach its consideration as either *author* or *secretary* (Smith 1982).

We review our own writing first as its *author*. While we are considering a piece of our own writing as author, solely for its beauty and truth, we specifically do not consider its spellings. We apply only the techniques we know to be valuable in knocking writing into the shape we want, and into saying what we want said clearly and well. When we are finally satisfied, as the author, that it is good writing which we like we switch into *secretary* mode and can begin looking at the detail (spellings and punctuation, for example) without paying any further attention to its linguistic merit. Both aspects of our literacy (we know because we have been specifically thus taught) employ distinct assessment and correction methods, and the skills of each are separately learned and are best separately deployed.

Tuition must deliver early and palpable success. It must demonstrate, immediately, the relevance and value of literacy to students. It does this best when it is student-centred (and validating students' experience), when it is problem-centred (directly relevant to students' felt and real-life needs), when it is immediately successful at the students' level, and when it advances at a speed which will challenge, yet not overwhelm, students. How will anyone other than Supertutor deliver such a broad collection of desiderata? The answer, of course, is that old, fundamental stand-by, *language experience*. (Beard 1993, Campbell 1995, Gittins 1993, Harrison & Coles 1992, Wray, in Wray & Medwell 1994) (And see notes to this chapter.)

The use and ownership of clearly understood methods with clearly understood purposes will enable success and the ownership of it, allowing the student to ride literacy rather than the other way about. This success, at the technical level, is half the battle against the corrosion of negative affect; the other half is simply the increasing awareness of affect itself as a relevant issue - its likelihood and its power. In itself, this awareness is something of an antidote to learned helplessness. Shifts may unconsciously occur. At the very least a balance may be tilted thereby. Awareness, though, is not the end of it. There are useful things to be done but there are also useful truths to be uncovered. In the affective wilderness there is probably nothing quite like a 'fact'.

An ABE student is not an ABE student by accident. Every one has a history. This is formative, of course. It holds clues to much of his attitudes, aptitudes and motivation, in respect of literacy, today. It holds clues to his affect - to his doubts, fears, joys, sorrows, loves and hatreds. Where these impinge upon his literacy and learning their

consideration becomes proper, perhaps necessary. The gradual production of a written, personal history, for example, particularly focussing on literacy acquisition, with associated discussion of its possible meaning, can be deeply informative and extremely cathartic.

Such a personal history may not easily be accessed, buried, as it may be, under decades of protective dissimulation, but it will be worth the search. Every student has a story to tell; many have some extraordinarily bitter ghosts to lay. The ghastly phantoms of guilt and self-hatred, once the student has pinned them to paper with words, are permanently immobilised and reducible to more realistic proportions thereby. It may become obvious that 'blame', properly regarded, lies in a complexity of events and influences which were absolutely beyond the student's control, even understanding, at the relevant time - probably a time when he was just an innocent infant. Some of the preposterous levels of guilt felt by students in respect of their failure to master literacy completely may thereby be shed.

As a new perspective develops, the magnitude and menace of literacy on the emotional and psychological horizon will diminish. Literacy will become less intimidating, more realistically proportioned. Grappling with it will seem ever more feasible as a result.

Chapter eight

Dyslexia

*In which the reader is invited to become sceptical,
look into hard and soft science and
consider whether dyslexia is benign or malignant.*

It was 'M', many years ago, who started the scales falling from my eyes. Although diagnosed as 'severely dyslexic' at an internationally renowned dyslexia centre his progress in the weekly adult literacy class was rapid and solid. 'M' travelled faster than most.

After a few weeks he suddenly remarked 'It's very odd!'

'What's odd?' I asked.

'You're the first teacher I've ever had who really expects progress and the odd thing is – that's exactly what we're getting!'

And then, 'You don't believe I've got dyslexia any longer, do you?'

Well yes, it did seem odd that progress was so suddenly (and so easily) attainable after such a long history of consistent and effortful failure. And no, 'M' was clearly not dyslexic, if we take dyslexia to mean an innate neurological disability specifically disabling the learning and management of literacy.

What was going on?

Over the years since 'M' left tuition (for university and a degree) I have come to believe that dyslexia is much underestimated. I believe it is a malign and depressing diagnosis of a condition which probably doesn't exist. I do not believe I am alone in this opinion, indeed I know I am not, but it is an opinion which needs to be defended, or explained, nonetheless, in a world in which dyslexia seems to be unquestioningly accepted everywhere and by everyone. This defence, or explanation, is what this chapter will be about.

The muddle of definition:

The term '*dyslexia*' is used, by most of us, very casually. We pick the word up lazily; without thought. We use it without properly defining it, or we define it in terms so

broad as to be next to pointless. We apply the term even when we are perfectly well aware that we have no clear definition of it, or satisfactory explanation for it. When we discuss dyslexia it can be correspondingly difficult to see what, precisely, we are discussing, if anything. The word is commonly used to mean nothing more scientifically exact than a difficulty with written language which we do not understand, or perhaps do not care to understand. We tend to use the term to denote a problem with reading &/or writing &/or spelling (and sometimes much more besides) which appears to be inexplicable - especially where there appears to be a discrepancy with what we'd otherwise expect from a particular person. We find the discrepancy so peculiar, so personally threatening, so deeply and intimately offensive, that we are driven to believe, almost to hope, that there must be something constitutionally wrong with the victim; that the cause must be a specific neurological deficit, beyond blame, safely located among all the other medical conditions beginning with 'dys-'.

Are we, as we so often do in other contexts, blaming the victim in order to pass the buck?

There is an established, and very rewarding, dyslexia industry. There is considerable academic and commercial vested interest. There seem to be as many aetiologies for (causes for or origins of) dyslexia as there are researchers into it, give or take, and as many wonderfully special assessment methods, remedial schemes, dedicated schools and distinguished gurus as the market will carry. There are breathtaking illogicalities, inconsistencies and outrageous assumptions throughout the scientific literature and beyond. The media cheerfully mangle and distort. Fantastically various definitions and explanations tumble around each other. Weird and colourful creatures appear fleetingly through the muddied waters - are they fish, fowl or beast? Mostly, they rapidly disappear again. But none of this seems to *bother* us nearly enough.

A few quotes from around the literature on dyslexia will illustrate this muddle:

The construct of learning disabilities has historically been difficult to define.
(Fletcher 2003)

... the history of dyslexia is littered with theories that were once widely supported but now lie abandoned on the scrap heap ... it is vital that we should continue to treat *everything* as questionable and to regard nothing as beyond dispute. Certainty is for tele-evangelists, not scientific researchers or teachers.
Ellis *et al* (1997 pp. 13-14) (their emphasis)

The concept of dyslexia has had a confused, cart-before-the-horse history...

Stanovich (1991 p. 22)

Definitions of dyslexia are notoriously varied and no single definition of dyslexia has succeeded in gaining a scientific acceptance which even approaches unanimity... Each researcher or clinician becomes attached to his or her own definition in a manner which is reminiscent of Humpty Dumpty in Lewis Carroll's *Through The Looking Glass* – 'When I use a word ... it means just what I choose it to mean.' Definitions ... soon become muddled when the researcher or clinician is confronted with a variety of adult cases exhibiting highly heterogeneous profiles.

Beaton et al (1997 p.2)

and:

The diversity of theories concerning the biological underpinnings of dyslexia is impressive... It is clear there is some way to go before any consensus is reached regarding the biological basis of dyslexia ... (ibid. pp. 4 – 5)

Students had individual clusters of the cognitive weaknesses usually associated with dyslexia, alongside clear strengths in some cases.....They were also accompanied by widely varying individual configurations of literacy and other difficulties, so much so that the students themselves wondered if they were experiencing the same syndrome. The identification of dyslexia could not by itself predict the individual configurations, and the question of whether or not there was one distinctive syndrome became less important than the issue of learning to describe one's particular situation to a world largely ignorant of these matters, eg 'I am dyslexic and for me this means that I literally cannot write my own name, but I can read quite well and I am now using a word processor.'

Herrington (1995 pp. 6 – 7)

The research literature provides no support for the notion that we need a scientific concept of dyslexia separate from other, more neutral, theoretical terms such as reading disabled, poor reader, less-skilled, etc. Yes, there is such a thing as dyslexia if by dyslexia we mean poor reading. But if this is what we mean, it appears that the term dyslexia no longer does the conceptual work that we thought it did. Indeed, whatever conceptual work the term is doing appears to be misleading.

Stanovich (1994 p. 588)

Over a decade ago ... there was little evidence that poor readers of high and

low IQ differed importantly in the primary processing mechanisms that were the cause of their reading failure. A further decade's worth of empirical work on this issue has still failed to produce such evidence.

Stanovich & Stanovich (1997 p.3)

One of the fascinations of dyslexia for researchers is that, whatever one's interest in human behaviour and performance, children with dyslexia will obligingly show interesting abnormalities in precisely that behaviour.'

Nicolson & Fawcett (1999 p. 156)

Writers often allow dyslexia a scientifically improper scope. Whatever symptoms or deficits they find, however disparate or infrequent, are claimed as indicative of dyslexia. Everything is subsumed. Try this translation of the immediately above:

'One of the fascinations of Foot and Mouth Disease (FMD) for veterinarians is that, whatever one's interest in bovine behaviour and performance, cattle with FMD will obligingly show interesting abnormalities in precisely that behaviour'.

If it were possible to say such a thing about FMD (it is not) one would be able to say, categorically, that FMD is either a collection of many syndromes which we have yet to distinguish from each other, or it is not a syndrome at all. No syndrome, however obliging, will show any and every symptom for which we look. We would know for certain, if this appeared to be so, that we were as yet too ignorant to say anything important about aetiology, effects or remediation. We would know that, as yet, we had no identified or understood syndrome to say such things about. We would treat our patient symptom by symptom, empirically, but be obliged to refrain from any diagnosis more precise than, say, 'sickly cow'. To do otherwise would be hubris, not science. It would also block progress towards understanding, not advance it.

What is dyslexia?

Definitions of developmental dyslexia are many and various, as Beaton *et al* observe. Some are so broad as to be almost meaningless, some are confused and imprecise, some say next to nothing. There is no consensus. A few examples will demonstrate this.

The World Federation of Neurologists' definition from 1968 was, for a couple of decades, the definition most widely quoted and some consensus gelled around it during that time. The WHO, for example, also defined thus in 1993. It goes like this:

Dyslexia is a disorder manifested by difficulty in learning to read despite

conventional instruction, adequate intelligence and sociocultural opportunity. It is dependent upon fundamental cognitive disabilities which are frequently of constitutional origin.

This may, though, be translated as:

‘Dyslexia is a difficulty with reading which may only be diagnosed if there are no other obvious causes to hand (such as poor schooling, poor parenting, low IQ or social disadvantage). It is caused by there being something wrong with the brain (well, very often, anyway).’

This uncertain definition is simply defining the syndrome as an odd difficulty with reading, given an otherwise apparently normal educational and social history. It almost amounts to a discrepancy definition (of which more later) and makes it impossible for a child from a socially deprived background to be ‘dyslexic’ at all.

The Dyslexia Institute (1989) defines ‘specific learning difficulty’ (which many use as synonymous with ‘dyslexia’) as follows:

Specific learning difficulties can be defined as organising or learning deficiencies which restrict the student’s competencies in information processing, in motor skills and working memory, so causing limitations in some or all of the skills of speech, reading, spelling, writing, essay writing, numeracy and behaviour.

This is so broad, invoking so many discrete and distinct cognitive domains, as to mean very little in fact. Are we to expect a ‘dyslexic’ to be defective in motor skills as well as information processing (whatever that means) *and* memory? Are we to believe that a ‘dyslexic’ with behavioural problems has these as a result of innate ‘organising and learning deficiencies’ (and what are these anyway and how will we recognise them?). If ‘dyslexics’ do not exhibit behavioural problems perhaps, or are not defective in, say, memory or motor skills, are they then no longer ‘dyslexic’ despite continuing poor literacy skills and difficulty in learning literacy?

The British Dyslexia Association (BDA 1989) defines thus:

Dyslexia can be defined as a specific difficulty in learning, constitutional in origin, in one or more areas of reading, spelling and written language which may be accompanied by difficulty in number work. It is particularly related to mastering and using written language (alphabetic, numerical & musical notation) although

often affecting oral language to some degree.

This is precise, in that it specifies that the syndrome is related to written symbols which represent language (or music and possibly number) and that it is definitely constitutional in origin. As we will see, this simple assertion (that there is such a specific difficulty) remains doubtful.

Moray House (1993) defines thus:

Specific learning difficulties can be identified as distinctive patterns of difficulties, relating to the processing of information, within a continuum from very mild to extremely severe, which result in restrictions in literacy development and discrepancies in performances within the curriculum.
Reid (1994 p. 3)

This definition very properly, as with the one above, restricts its scope to literacy, which is more than many do. (*dys* [Greek] means difficult, abnormal, impaired and *lexikos* [also Greek] means pertaining to words. Let us not forget this.) It relates the difficulties, though, to defective information processing. This sounds satisfyingly scientific and would, perhaps, be a satisfactory explanation for a defective computer. However, in today's climate of deep ignorance as to what, exactly, our brains consider 'information' to be, what they actually use as 'information', and just exactly what they are doing when they 'process' it, the phrase 'information processing' denotes too vague and ill-understood a concept to be of much psychological value, at least as yet. We are certainly not in any position to assess it in any very meaningful way, particularly not in a neurologically meaningful way. (and see Chalmers 1996, Reilly 1985 & Smith in Olson *et al* 1985) This definition amounts to declaring that specific learning difficulties are difficulties in learning which vary from very mild to very severe, and that these difficulties are related to a deficit in a process of which we have extremely small understanding. The patterns of difficulty are allegedly 'distinctive', but in an unspecified way.

I will be discussing the use of the diagnosis as an alibi explanation, and as one which very conveniently, and comfortingly, locates the blame for literacy failure entirely within the victim's central nervous system. Occasionally even the internationally recognised expert lets this one out of the bag as in Miles (1988) quoted in Pumfrey & Reason (1991 p. 69):

For him [Miles] the term dyslexia assists parents and the child to make sense of occurrences they know to exist. They know the child has difficulty with reading

and spelling; they need explanations which remove the sense of self-blame.

Pumfrey and Reason compare this with the 'it's my hormones' explanation of obesity. It is comforting, perhaps, as it absolves from responsibility, but this explanation entirely fails to understand, or make any attempt to solve, the real problem which, as we all strongly suspect, has nothing to do with hormones. An elephant in the room, in fact.

And then sometimes researchers let another out of the bag as when Cooke says (2001 p. 49):

Miles (1995) has questioned whether there can be a single definition of dyslexia; she suggests instead that different people, and different groups, will want a definition to suit their own requirements. This is clearly correct ...

This is, of course, giving up without a blush. If we are all to select our own, personal definition to suit our own particular agenda, then we may as well communicate in grunts for all the sense we will make. 'Dyslexia' has been researched for over a century now. It is astonishing, and considerably revealing, that such confusion still exists and such woolly remarks are still accepted in apparently serious, peer-reviewed, scientific journals.

The Shorter Oxford English Dictionary (1993) probably does as well as any with: 'A developmental disorder marked by an extreme difficulty in reading or in understanding written language; word blindness.' This definition recognises, incidentally, that dyslexia, very strictly speaking, relates solely to reading. The corresponding difficulty with writing or spelling should, properly, be termed 'dysgraphia'. However, we don't want to get in so deep we can't get out again so I will adopt the widespread habit of taking 'dyslexia' to refer to all literacy skills. (I will not adopt the habit of taking it to refer to any failure in any skill or characteristic as in, for example, 'emotional dyslexia' or 'economically dyslexic' (both from BBC Radio 4). Quaintly, I will assume that words have meaning and will try to use them accordingly.)

When I write 'dyslexia' I will mean developmental dyslexia which I will here define as '*a difficulty in acquiring or managing literacy skills which is caused by an innate neurological deficit of some kind*'.

Frith (1999) has written a fascinating article on precisely this subject: 'Paradoxes in the definition of dyslexia.' In it she accepts that 'The first of these paradoxes concerns the lack of agreement about the very definition of dyslexia' (ibid. p. 193). She proposes an interesting map on which, she suggests, researchers may inscribe suggested causes and

effects such as to build up a multi-layered overview of dyslexia and thereby inch nearer to describing and defining it. She suggests the map should include possible biological causes (brain abnormalities), possible cognitive deficits and possible behavioural problems – all of these related throughout to environmental factors. Tellingly, in an article published in December 1999, about a century since research into ‘word blindness’ began, she writes that ‘In unknown territory this map is largely white, but it will soon be filled in by intrepid explorers.’ (ibid. p. 193). It is highly instructive to read this article which makes it very clear how far we really are from either consensus or understanding.

The fact is, as you can see, that none of us appears to have very much idea what ‘dyslexia’ might be. Regrettably, this does not stop us from making extremely detailed and definite assertions about ‘dyslexia’ and taking sometimes far-reaching action on the basis of these assertions. In major popular texts on the subject one may read statements like this:

The fact that no exact definition [of dyslexia] has yet been produced is of little consequence...THERE IS ANOTHER QUITE DISTINCT GROUP who have difficulty with reading yet are very able in other ways... for convenience we refer to them as being DYSLEXIC or having DYSLEXIA. Parents, teachers and others understand these words and find them to be an easy form of verbal shorthand to describe the children with whom we are concerned.
Doyle (1997 p. 82. his emphases.)

This will not, of course, do. To employ resonant neuropsychological terms for which we have no agreed definition and about which we remain thoroughly ignorant as if they have highly specific and well-understood meaning is spurious. It is improper. It is arrogant and it is fraudulent. We may not legitimately use terminology which appears, particularly to the general public, to be scientifically precise as ‘an easy form of verbal shorthand’ to mean almost anything almost anyone (eg. ‘parents, teachers and others’) wants to intuit. We may not properly diagnose subtle, but possibly disabling, neurological deficits on the basis of such imperfect knowledge, asserting that the fact that we understand them not a whit is ‘of little consequence’. A diagnosis may have very real consequences; not all will necessarily be favourable.

‘Diagnosis’ is a grown-up word for a grown-up activity. It demands a proper understanding, but it also demands a proper humility, most particularly in the confessed absence of understanding.

Why all the fuss?

What does it matter whether there really is such a neurological deficit, so long as people who need tuition get tuition? I believe it matters very much, for several reasons. Firstly, much thinking about dyslexia is almost wilfully sloppy and sloppy science never did anyone any good, very particularly the subjects of it. Many appear willing to make the diagnosis, rather fewer are qualified so to do. (We are, after all, discussing neuropathology here!) Many diagnoses stand on small, highly controversial and rather subjectively assessed, evidence.

And then, people given a diagnosis of a neurological deficit may find such a label at the least disconcerting, at worst devastating. ('That was another big shock, finding out you're disabled!' cried one student. [Whitehouse 1995 p. 21])

And then, what about those who don't achieve the label? Are they simply (and publicly) to be designated as stupid?

And then, we don't appear able to see over or around dyslexia; once the diagnosis has been invoked we seek no other explanations for presenting phenomena. Simpler alternative, much more everyday, scientifically duller, less sexy (and much less lucrative) explanations are very much less assiduously sought once a diagnosis of 'dyslexia' has been made.

And finally, and crucially, in the face of such a diagnosis we appear to act differently - we seem to see a need for deficit-focussed, repetitive, tightly controlled and limited practice (e.g. Lee 2002), and we seem abruptly to experience considerably depressed expectations (Kerr 2001 a & b and see notes to this chapter). Suddenly we are content with poorer results - slower and less accurate outcomes more laboriously produced. We may become more sympathetic, but we also become less demanding. We aim lower. We teach mechanics and detail rather than purpose and flair, rules rather than writing. This is inevitable once we have attributed a student's problems to a single, conceptually simple (albeit imperfectly understood), innate and unalterable cause. This is classic soil in which to grow learned helplessness - and assuredly not only in the student.

Perhaps we should step back and think about what it is, and isn't, that we are actually discussing. Dyslexia raises hackles and passions. People, as you may already have begun to suspect, become highly partisan. Blood pressures, as you may have observed, rise. Tempers easily fray. It behoves me, therefore, to make precisely clear what I am saying and, probably even more importantly, what I am not saying. For reasons which will

become clear, I believe dyslexia is very important, a deadly serious problem, albeit a virtual one.

Firstly, what do I mean by dyslexia? There are two kinds of dyslexia – acquired and developmental. (*Developmental* dyslexia is what everyone really means when they simply say ‘dyslexia’, a habit I shall maintain here.)

Acquired dyslexia is rare, at least in ‘pure’ form. It is thoroughly unpleasant, but perfectly understandable in terms of cognitive psychology and so is not scientifically controversial. Acquired dyslexia is the result of trauma to the brain occurring after literacy has been learned by it. Some accident (a blow to the head, or perhaps a stroke) results in damage to the part of the brain which had learned literacy skills. Depending on the degree of damage, the skills will be correspondingly lost. The same applies to speech, of course. Many stroke victims have their speech centres damaged and show varying degrees of loss of the power of speech. This is horrible but makes perfect cognitive sense – if you damage the part of the brain which has learned to be responsible for such and such a skill then that skill will be correspondingly damaged. How could it be otherwise?

Developmental dyslexia is an utterly different animal. Here, there is assumed to be an *innate* neurological deficit of some kind. (If there is no innate neurological deficit behind dyslexia it is, of course, simply a surprising difficulty with literacy, not a ‘dys’ at all, and back to square one we must all go.)

In *developmental* dyslexia the neurological deficit is presumed to be innate, or pre-wired - to have been present since conception or at least since birth. Some claim that the deficit is written into the genes (eg Cardon *et al* 1994, Fisher *et al* 1999, Olson 2004) but others claim that the deficit is the result of damage to the foetus during gestation, for example biochemical trauma *in utero* (eg Geschwind and Galaburda 1987). At any rate, developmental dyslexia is presumed to be a defect or affliction, present from birth or the very earliest childhood, of those parts of the brain which will one day, when the time comes, be expected to learn the skills of literacy. It is, in this view, an innate defect, irremediably hard wired into the brain which is innately pre-wired to learn literacy only in a particular location or locations.

These ideas are, biologically speaking, extraordinarily unlikely, as we shall see later. They are also peculiarly pessimistic.

Secondly, what inferences may righteously be taken from a stance of scepticism towards this neurological deficit explanation for surprising difficulty with literacy? One inference

that may *not* properly be taken is that the holder of a sceptical opinion towards dyslexia is also sceptical that there are large numbers of people with literacy difficulties. Clearly, and to the certain knowledge of this author, there are many such, and equally clearly many experience rather peculiar difficulties. To doubt that there is a neurological fault in their brains is not the same as denying that they have a problem.

Further, and by exactly the same token, the inference that a dyslexia sceptic must think that special educational provision is unnecessary for people with such a surprising difficulty with literacy may also not properly be made. Clearly, people with special difficulties need particular assistance; they should better, perhaps, have practical help without a diagnosis of an incomprehensible, improbable and everlasting neurological defect having to be 'diagnosed' first.

This is because, thirdly, a diagnosis of an innate defect in the brain may cause *learned helplessness* in student and tutor alike (Kerr 1999, 2001a, 2001b). And this is because such a diagnosis is a *maladaptive attribution* – an attribution which disempowers and disadvantages. The literacy difficulty is, by its own definition, being attributed to an innate deficit within the student, which cannot be 'cured' and which can barely be overcome. Extraordinary measures and Herculean efforts will be necessary if it is to be, at any rate. The condition, it has logically to be presumed, will forever make the learning of literacy much slower, less certain, more improbable and more difficult than it would be for a 'normal' person.

To accept this is to descend into the damp and fetid cellars of educational pessimism where learned helplessness grows like a fungus, consuming pleasure, motivation, enthusiasm, confidence, curiosity, engagement, stamina, expectation and performance. This fungus will, of course, infect everyone - family, teacher and taught alike.

Who is 'dyslexic'?

In this section we will consider the main research-based scientific theories concerning the origins and manifestations of dyslexia. First, and fundamental, we consider sample selection.

The most basic aspect of research into any particular group's characteristics is the selection of the sample to be studied. In order to study a particular group of people (for example diabetics, vicars, redheads or management consultants) the characteristics by which membership of the group is awarded must be defined as closely as possible. Criteria would, ideally, include all group members and exclude all non-members.

If the study were to be of management consultants, for example, it would not be sufficient simply to include everyone who came to work on a particular train dressed in a dark suit. Such a sample might include several management consultants, but it might also contain dentists, advertising executives, I.T. consultants, white goods salesmen, up-market pickpockets, domestic science teachers, junior ministers and many others. Results of research on such a sample would not be dependably valid in respect of management consultants. It would not have been carried out solely among people known to be management consultants. We would not dependably reach a true sample of management consultants using this blunt selection process. Our research results will not be defensible unless we apply better, tighter sample selection criteria.

Thus it is, of course, with research into 'dyslexics'. Before any meaningful examination of 'dyslexics' is carried out, the criteria for selection must be made clear. Who is 'dyslexic' and who is 'normal'?

Assessment for dyslexia for the purposes of scientific research almost universally continues to regard the *intelligence/achievement discrepancy* criterion as the single pathognomic indicator of dyslexia and researchers either use it themselves, or rely for diagnosis on educational psychologists who use it. (A pathognomic sign is one which, even occurring alone, is sufficient absolutely to indicate a particular syndrome.) The discrepancy criterion is elucidated as follows: The IQ of a person is measured, and then their performance at some literacy skill or skills - reading, for example. The decision is made to consider someone as 'dyslexic' where there is a discrepancy of more than such and such an amount between the performance expected from a person with their particular measured IQ, and their actual performance in administered tests.

The discrepancy is often expressed as a *reading age discrepancy* (a discrepancy between their expected reading age according to IQ and their reading age measured by actual reading performance).

Considering a particular discrepancy between measured IQ and performance on norm-referenced literacy tasks to be pathognomic for 'dyslexia' is problematic on two counts. The first is the increasingly frequent finding that a population defined as dyslexic by an IQ/achievement discrepancy criterion does not, in the event, differ reliably or importantly from the general population (Fletcher 2003, Fletcher 2004, Fletcher, Denton & Francis 2005, Fletcher *et al* 2005, Miles & Miles 1999, Samuelsson *et al* 1999, Siegel & Himel 1998, Stanovich & Stanovich 1997, Stanovich 2000, Stanovich 2005, Stuebing *et al* 2002). The discrepancy criterion is, to put it plainly, no longer held to indicate 'dyslexia' or any other neurological learning difficulty reliably, or even at all.

IQ/achievement discrepancy certainly indicates the existence of a problem (it is a discrepancy after all) but the measure says nothing useful about its aetiology (its origin or cause).

Most frontline research, even recent research, and most consequent theorising on the nature or remediation of 'dyslexia', however, rests on this definition of the sample population as distinct, different and dyslexic by application of this discrepancy criterion, and by this criterion alone. (eg Brooks & Weeks 1998, Fisher *et al* 1999, Hanley 1997, Hogben 1997, Hynd *et al* 1995, Nicolson & Fawcett 1999 and many, many, many more. Some are coy – Shaywitz's widely read book (2005) states clearly that the discrepancy criterion is no longer valid as a diagnostic tool, but lets slip that the research the book is largely based upon is the Connecticut study, from a few years back. The sample population for that study was identified as 'dyslexic' by exactly that discrepancy criterion.)

Such studies, and such conclusions, may thus be fundamentally, even fatally, flawed. Many subsequent studies, notwithstanding, rest their arguments entirely upon, or take as their starting point, the results and conclusions from these earlier studies, almost all of them based upon the discrepancy criterion. Where sample selection is invalid, then so are results and so are conclusions and so is almost all we think we know about 'dyslexia'. This is fundamental, so let us look carefully and sceptically at the evidence and the debate. How valid is the discrepancy criterion as a selection tool for 'dyslexia'?

Samuelsson *et al* (1999 p. 94-95) state that '... the use of IQ achievement discrepancy definitions does not constitute a valid approach to define sub-groups of poor readers.' Stanovich (1991 p. 22) says that 'Defining dyslexia by reference to discrepancies from IQ is an untenable procedure.' Siegel & Himel say (1998 p.91) that '... the use of an IQ-based discrepancy definition of dyslexia is invalid on variables closely related to the reading process.' and on p. 102 that '...the use of IQ to define dyslexia (or reading disabilities) seems fatally flawed because of the confounding with SES [socio-economic status] and age.' Adams (1990 p. 59) says that 'Whereas IQ & general cognitive skills seem not to have much bearing on early reading achievement, early reading failures seem to result in a progressive diminution in IQ scores and general cognitive skills.' Stanovich & Stanovich (1997 p.6) write that 'In the largest longitudinal growth-curve investigation ever conducted, Francis *et al* (1996) reported that IQ was completely useless for predicting future reading growth among poor readers.' Miles & Miles (1999 p. 114) say that 'It is perhaps strange that this notion of a discrepancy definition survived as long as it did.'

A single issue of the journal *Dyslexia* considers this subject. In it, various authors dispute the validity of the IQ/achievement discrepancy criterion as diagnostic tool. (Miles 1996, Share 1996, Stanovich 1996, Tunmer & Chapman 1996, and see Cotton *et al* 2005.) Stuebing *et al* (2002) have produced a highly regarded meta-analysis of research in this area, clearly showing that the discrepancy criterion should no longer be regarded as valid, and it should no longer be used as a tool for the diagnosis of dyslexia. If this is true today, then it was also true yesterday, of course.

Keith Stanovich seems frustrated. He writes that

The persistence of the discrepancy concept in LD [learning difficulties] signals that the field is not yet ready to put itself on a scientific footing and that it will continue to operate on the borders of pseudoscience... The field suffers greatly from its tendency to base practice on concepts and psychometric technologies that have been superseded by subsequent scientific advance. I am referring here to the field's persistence in linking the definition of learning disability to the concept of aptitude-achievement discrepancy and identifying aptitude with intelligence test performance.

(Stanovich 2005 p. 103)

Fletcher (2004) observes that 'Recent empirical synthesis and consensus reports share the common finding that IQ is ineffective in the identification of LD [learning disability] ...' and that 'It is widely recognised that the presence of IQ-discrepancy ... does not mean that the student has a neurobiological disorder.' He says that 'The clear consensus ... is to abandon the ability-achievement discrepancy model.' (And see Fletcher, Denton & Francis 2005 & Fletcher, Francis, Morris & Lyon_2005 reporting 'serious psychometric problems' causing low reliability and validity of aptitude-achievement discrepancies as indicative of learning disability - it is not possible accurately, well, or in some cases at all to measure that which we have claimed to measure).

When reading literature claiming that 'dyslexics' exhibit this or that symptom, or behaviour, it obviously behoves us to ascertain how the sample of 'dyslexics' was arrived at – how were they diagnosed. If it was by the discrepancy model of diagnosis, as is almost always the case, the findings are thereby rendered invalid and should, properly, be ignored. They seldom are. Indeed, such findings regularly march cheerfully on, underpinning and 'validating' later work, in bibliography after bibliography. The 'borders of pseudoscience' indeed.

Two other observations are relevant in this context.

One is the disassociation between IQ (whatever it might, or might not, be) and reading. They do not correlate well. IQ does not predict reading ability at all well. Reading is well learned by people with high IQs but it is also well learned by those with low IQs. Reading is, in fact, a rather low-level skill and it does not demand high intelligence (Stanovich 2000). (By 'reading' right here I mean decoding to meaning. How well you subsequently manage information you read does, of course, depend at least partly on your intelligence. The actual reading does not.) Also, it should here be noted that reading well tends to increase IQ whereas reading poorly tends to cause IQ to fall, over time. This is presumed to be because we gain so much of our understanding and knowledge, as well as vocabulary (that with which we formally think) from text, one way or another, and are exposed to so much of our culture, and the wider world thereby. (Adams 1990, Siegel & Himel 1998 and Stanovich 1991).

A second, and perhaps equally fundamental, difficulty lies in the concept of IQ itself. What is it? Some writers (e.g. Turner 1997) claim to measure a multitude of different IQs in a multitude of different cognitive domains with great precision, though even Turner finds himself saying that:

It has often been said that the best indicator of dyslexia in young children is the performance of the father on a reading test. As 80 per cent of cases may be identified in this way, it would compare favourably with more elaborate screening exercises! (ibid. p. 224)

Gipps and Murphy are more circumspect. They say (1994 p. 71) that '... IQ tests are biased in favour of individuals from the dominant culture who designed the tests; in the UK this means those from a white, male, Anglo-Saxon background and, in addition, middle class.' They also say (ibid.p.74) that it is '... impossible to devise tests which do not depend heavily on knowledge which is culture-dependent.' and (ibid. p.90) 'The aura of scientific objectivity surrounding IQ tests meant that there was little attempt to question them.'

As Stanovich (1991 p.9) says – '... one would be hard pressed to find a concept more controversial than intelligence in all of psychology.'

Adams (1990 p. 59) claims that '... IQ is only weakly and non-specifically related to achievement in the early grades.' Siegel & Himel say (1998 p. 91) that:

...the IQ measure is problematic because of several aspects of the IQ test ... IQ is strongly related to socioeconomic status ...IQ is actually a measure of the type of knowledge that is dependent, to a large but unknown degree, on the

environmental experiences of the child.

Stanovich (1991 p. 10) writes similarly that:

... most psychometricians, developmental psychologists and educational psychologists long ago gave up the belief that IQ scores measured potential in any valid sense ... an IQ test is not properly interpreted as a measure of a person's potential.

Educational psychologists and researchers into dyslexia, notwithstanding all of the above, still regularly use IQ and IQ/achievement discrepancy tests, to make exactly such 'measurements', and to diagnose 'dyslexia' on the strength of it, or at least continue to use data relating to sample populations selected in this manner (e.g. OFSTED 1999, Shaywitz 2005).

And, as an aside in passing, there is a workable alternative to using the discrepancy criterion. In response to the understanding that an IQ/achievement discrepancy indicates nothing particularly useful, and certainly nothing 'diagnostic', a different approach has been developed in the USA. It is known as *RTI (Response To Instruction)* (See Fletcher 2005, Fletcher, Francis, Morris & Lyon 2005, Fletcher, Denton & Francis 2005 & Kovalski 2004). RTI avoids psychometric testing (in particular IQ) and focuses instead on a student's response, in terms of learning, to instruction received. This has the advantage of relating to an individual's progress or otherwise as it happens (rather than after failure has already occurred), thus being child-centred, immediate and relatively easily operationalised in the real world. It is based directly on practice, so leads directly to appropriate teaching responses. Indeed, as its title indicates, it focuses, quite deliberately, on instruction as well as response. Where there appears to be a problem, educational consideration is immediately drawn to the teaching offered to the student as an individual as well as to his or her learning.

In the words of Fletcher, Denton & Francis (2005 p. 545) 'Hybrid models combining low achievement and response to instruction most clearly capture the LD [learning disabilities] construct and have the most direct relation to instruction'. (In my opinion it is unfortunate that the RTI tool should be used to continue the search for disabilities, so perpetuating the deficit approach and its attendant maladaptive attributions, but it is also my opinion that RTI does not actually have to be thus. The tool could simply be deployed to find, and address, any learning difficulty in any subject. I imagine that many of the better teachers subvert it exactly thus, in real classrooms.)

Some writers use a different discrepancy to diagnose dyslexia - that between

chronological (actual) age and 'reading age' - usually demanding a discrepancy of two or more years (e.g. Williams & O'Donovan 2006). However, such a discrepancy is merely a sign. It is just a symptom. It says nothing, in itself, about the underlying cause or nature of those influences which might be causing it. It is like observing that at any one time a certain percentage, say 10%, of people are likely to be lame and then going on to claim that this indicates that 10% of us has a sprained ankle. The one fact does not at all reliably indicate the other. Thus it is with 'dyslexia'. If someone has a chronological age / reading age discrepancy it tells you only that they read poorly for their age. It tells you nothing of why this is so. We may not properly deduce any aetiology from the discrepancy itself. It is 'diagnostic' of nothing whatsoever other than an unfortunate and as yet unexplained discrepancy.

Those few researchers who attempt to diagnose dyslexia without reference to a discrepancy criterion are beginning to use performance related signs which they claim are pathognomic. There are many tests of literacy abilities to choose between, including single word reading, spelling, pseudoword reading, irregular word reading, homophone/real word choice, homonym choice, phoneme manipulation, rapid automatic naming and reading speed - all mentioned, for a single example, in Paracchini *et al* (2007). They go on to write that 'Unfortunately, there is not universal agreement on which precise ascertainment criteria and psychometric tests should be applied, and different research groups typically use a specific selection of them, often dependent upon the language of the population under study' (*ibid.* p. 59).

There is no consensus, as you can see, as to which test, or which battery of tests, enables a 'diagnosis' reliably to be made. Researchers literally pick and mix. 'Performance deficits' selected by the researcher are said, by the researcher but without evidence (as there is none we can rely on), to be typical of and pathognomic for dyslexia. Researchers differ widely as to which tests are appropriate and what their results may indicate. Such highly subjective criteria for sample selection and such individual interpretation of findings does not, however, stop considerable reliability of diagnosis, validity of result and comparability of conclusion being claimed.

A further means of 'diagnosis' of dyslexia and selection of sample 'dyslexics' is simply to throw in the sponge, deploy the '*bell curve*' of reading ability and define those in, say, the lowest 10% as 'dyslexic' (e.g. Olson 2006, Paracchini *et al* 2007).

As you will know, the *normal distribution curve*, or bell curve, is the curve which can be plotted for any attribute which is *normally distributed* across a population (height is the usual example). The curve looks like a bell, hence the name. Reading ability is normally distributed. If you plot reading ability across the population you get the familiar bell

shaped curve. It is easy to select, say, the bottom 10% of such a population from their results on reading tests and consequent place on the curve. As Paracchini *et al* write 'RD [reading disability] represents the lower tail of a normal distribution of reading ability found in the general population' (ibid. 2007 p. 59). Kate Nation (2006 p. 2) reaches the same over-extended classification when she writes about '... individuals who are at the low end of distribution – individuals who are reading disabled'.

Olson further claims that 'the positive consequence of the bell curve in reading research is that it allows us to apply powerful statistical methods in our genetic analysis of dyslexia and individual differences that depend on normal distributions ...' (Olson 2006 p. 3). Suspiciously convenient!

It may be useful, in certain limited circumstances and in certain rather broad but limited ways, to identify and analyse those in the lowest 10% of reading ability. However, it is not legitimate to claim that simply because they all find themselves in this bottom 10% they must all share any particular characteristic, let alone all suffer from the same syndrome, without further evidence that this is so. We have no evidence as to why these poor readers are in this group. We can guess, though, that there will be many and very various reasons for their poor reading. All we can properly say from contemplation of the bell curve is that they all seem to be poor readers. It is improper to claim more than this on this evidence – especially to claim that membership of the poor readers group *per se* indicates possession of a neurological deficit – indicates that all these people suffer from dyslexia. We cannot say this with any certainty whatsoever – the reasons for inclusion in this group will be numerous and various.

These poor readers do not constitute a group which is reliably homogeneous. For this reason sophisticated statistical and/or genetic analyses and conclusions in respect of 'dyslexia' are not appropriate, however tempting the wonderful mathematical potentials of the bell curve and the statistical marvels of normal distribution.

A frivolous example to illustrate this general point: Suppose we set up a driving test whereby a thousand randomly selected people are asked to drive a car across rural Wales between two points 50 miles apart. We measure their performance. (Time taken, number of bumps recorded, frequency of road rage incidents etc.) The results will probably approximate to a bell curve of normal distribution of whatever we have decided to define as 'driving ability'. Would this statistical fact mean we can consider that the worst 10% of drivers all share the same characteristics, though? Are they all poor drivers for the same reason? Of course not. Some may have been drunk, or high, others may have been partially sighted, others may have been teenage males charged with testosterone, others again may have been elderly and very cautious, some may

have driven for years while some may only just have passed their test, some will only just have got off the plane from Australia, some will have been rendered hopelessly nervous by the knowledge that their driving was being tested, for some the route will be familiar while for others it will be completely novel. And on and on. There will be a plethora of reasons for their poor performance, and regarding these drivers as a homogeneous group with a single 'syndrome' (dysautomobilia?) will not be valid.

Nor will it be particularly useful. It will not reliably reveal much of interest, either to science or to the department of transport. Our findings will not enable us to apply sophisticated analyses to make generally useful policy decisions, in fact, nor to reach any particularly valid conclusions about the drivers themselves.

Olson says that

the problematic consequence for the diagnosis of dyslexia is that in spite of the frequent and varying citations in the literature about the percentage of children who have dyslexia, dyslexia does not exist as a discrete diagnostic category that is distinctly separate from the normal population distribution. Statements about the percent of children or adults with dyslexia are based on arbitrary cut points on the low ability tail of the normal distribution, and this is true even if some sort of IQ-reading-discrepancy criterion is employed. (Olson 2006 p. 3).

As we have seen, there are major issues with all of this, and inevitably also with conclusions drawn from research using such non-specific means of selecting populations of 'dyslexics'.

Since there are still no standard, generally agreed pathognomic signs of dyslexia, or tests for it, partly as a result of there being no standardised 'dyslexics' and partly because of the ongoing and acute lack of consensus as to the real nature of dyslexia, all such diagnoses, and all consequent sample selections, are highly questionable. So, of course, is all the science based upon the study of such sample populations and so are all the conclusions allegedly reached thereby.

In short: Studies on 'dyslexics' all experience the same, absolutely fundamental problem, namely the all-important selection of their sample. The question 'who is dyslexic?' has yet to be answered.

The 'gene for dyslexia':

Saint Augustine reputedly wrote 'For so it is, Oh Lord my God; I measure it, but what it is that I measure I do not know.' This quote should illuminate the following discussion on the genetics of literacy. I don't understand genetic discourse well but I insist on my right, and my duty, to remain sceptical while watching this space with a great deal of interest.

Literacy attainment, or otherwise, is a very complex social and cognitive issue. Many ill-understood influences powerfully (and variably) affect it. Individual case characteristics and whole-population findings do not necessarily relate at all well. In the words of Steve Ramm "Splitting complex phenomena into genetic and environmental components is just about impossible and, of course, each will feed back upon the other." (personal communication September 2007). This aspect of our debate is, regrettably, much more complicated than it looks at first.

I find the genetic 'proof' of dyslexia the most difficult to deal with. It is difficult for two reasons, first because it seems to me, as a biologically trained person (I am a veterinary surgeon in 'real life'), to run directly counter to common sense, but second because it is a subject which is, perforce, mediated (and understood) through fancy mathematics as genes exert their effects by interacting among each other and with their environment in extremely complex ways we do not yet fully understand (to say the least). I have immediately to confess an inability to follow the mathematical arguments intelligently, or indeed at all. I am, therefore, not able to challenge 'proofs' in the mathematical arena. There are nonetheless relevant, if captious, observations which may perfectly properly be made by the sceptical but mathematically inept, such as myself.

There are many papers in which genetic effects on reading, and on dyslexia, are claimed (e.g. Cardon *et al* 1994 [corrected 1995], DeFries 1997, Fisher *et al* 1999, Olson 2006, Paracchini *et al* 2007, Schumacher *et al* 2007, Williams & O'Donovan 2006) and it will be very interesting to see what the map of the human genome eventually tells us. The genetic argument is an important strand in the debate, as it seems to be saying extraordinary and potentially considerable things and should suffer some critical analysis. Here, I describe some of the work done and display its findings in such a way, I hope, as to allow you to deduce your own responses as well as to read mine.

Every one of us is made up of zillions of cells all containing, and all controlled by, an identical set of 23 chromosomes which make us, genetically, who we are. Each chromosome consists of an immense chain of genes. Each gene is made from a complex protein called *DNA* (deoxyribonucleic acid) – the famous double helix. All DNA is made

from a small number of amino-acids. The order in which these amino acids appear on a gene varies between genes and is the *genetic code* (a bit like an alphabet where each amino acid is a letter). Each gene is a unique code, its amino acids arranged in a unique order (a bit like a set of words). Our DNA is unique to us in that the arrangement of amino acids on my genes and genes on my chromosomes is mine and mine alone. Hence its forensic value - it identifies me uniquely.

The process of 'reading' amino acid and gene sequences – the human genome - is mechanised today and is relatively easily done. Our genomes are already easily deciphered and their alteration to order may be within reach. Scarcely, it might, one day, be possible to reconstruct me (maybe even create an improved me) from a sample of my DNA. More interestingly, it may be possible to reconstruct extinct creatures from bits and pieces found here and there. The dodo might yet live again.

Our genes are responsible for our inherited characteristics. Every gene encodes information (as a particular ordering of amino acids) and a gene may issue instructions within a cell by causing the cell to encode a protein with amino acids ordered in its own image. However, each gene also interacts with, competes with, other genes, with our own physiology, with our own characteristics and with our environment to exert its effect. It's a fiendishly complicated area of knowledge and is very much still in its infancy. We are our genes (up to a point) and we are our history and our environment (up to a point) - the problem in any particular instance is, up to which point? For any aspect of ourselves, in this context, the question remains - nature or nurture? The answer is very seldom clear.

We need, of course, loudly to note that finding a gene, or a *QTL (Quantitative Trait Locus)*, which appears to have some effect, in some circumstances, on an attribute or ability (reading, for example) is assuredly not the same as finding 'the gene for reading'. (A QTL, incidentally, is often rather broader than a gene. It is a section of a chromosome which appears to have an effect on something. It may be as small a section as a single gene, but it might be a section of chromosome many genes wide.)

We, and our media, are often appallingly sloppy in our use of terminology and we often say things which are frankly ridiculous as a result. The discovery of 'the gene for dyslexia' is often hailed, for example, even in supposedly 'good' newspapers. We must keep our wits lively about us unless we are to be led down the seductive paths of prejudice and simplification towards nonsense.

Fisher *et al* (1999), for a preliminary example, claim that between five and ten per cent of schoolchildren are affected by dyslexia (but define their 'dyslexics' by

IQ/achievement discrepancy). Within the sample thus selected they claim to have found a QTL on chromosome 6. This QTL '... affects both phonological and orthographic skills and is not specific to phonemic awareness.' (Fisher *et al* 1999 p. 146). And '... this locus affects both phonological coding and orthographic coding.' (ibid. p. 152). (NB. These were tested by non-word and irregular word reading. Both probably 'test' for many things other than, and perhaps in many cases much more powerful than, linguistic codings.) They suggest that this QTL is '... involved in an underlying mechanism that is common to the development of both types of skills.' (ibid. p. 155) In other words, Fisher *et al* claim to have found a QTL which supports both reading and spelling skills. They do, though, also say that '... there may be substantial phenotypic variability among subjects designated as affected and there is some dispute about the nature of the core deficit.' (ibid. p. 146) and '...any genetic basis for this disorder [*dyslexia*] is likely to be complex.' (ibid. p. 146).

There is, in other words, plenty still to debate, and the appropriate attitude remains sceptical but open-minded interest.

Olson (2004), studying sets of identical (MZ or monozygotic) and non-identical (DZ or dizygotic) but same gender twins, concluded that approximately half of the reading difficulty he observed was genetically determined. He makes the claim that 'in spite of the high heritabilities for group deficits in phoneme awareness and phonological decoding these deficits can be substantially remediated and even normalised.' (ibid. p.120). (Shaywitz (2005) makes the same claim and even shows scans of apparent changes in gross brain function patterns to show this apparently happening before our very eyes. It is unclear, at least to me, why an innate, hardwired deficit so effectively prevents learning under 'natural' circumstances but allows it to 'normalise' so readily under others. This is an extraordinary claim. Brain scans are also tools of highly debatable value in such a context - and see later.)

Olson found group deficits due to genes at these rates in phoneme awareness (.72), phonological decoding (.71) and orthographic coding (.67). This last is extraordinary in that it seems to indicate a genetic effect on spelling - a 'gene for spelling' in media-speak!

Finally, I would wish to note, in respect of this work, that orthographic coding is utterly different from phonological decoding or phoneme awareness, presently widely regarded as the 'core deficit' in 'dyslexia'. Orthographic coding and phonological coding, as we have seen, are utterly different cognitive acts, taking place in utterly different cognitive domains and utterly different anatomical sites. Wherever, and however, we look we seem to find genetic 'explanations' for 'dyslexia'. It is difficult to see what is

being found, or measured, and extreme caution in interpretation, even acceptance, of apparent findings is absolutely appropriate.

DeFries (1997) offers an interesting review of dyslexia studies among MZ and DZ twins. He reports that Stevenson *et al* (1987) studied such twin pairs in which at least one member of each showed reading or spelling backwardness (measured as a reading age/chronological age discrepancy) or reading or spelling retardation (measured as IQ/achievement discrepancy). They claimed that 'whereas genetic factors may be important as a cause of reading disability at younger ages, spelling difficulties appear to be more heritable than reading deficits at 13 years of age.' (DeFries 1997 p. 21). They claim, in fact, that spelling is '... the most clearly genetically influenced literacy skill.' (Stevenson *et al* 1987 p. 243, quoted in DeFries).

Wadsworth *et al* (1989) and DeFries *et al* (1991) (both reviewed in DeFries 1997) produce data which they claim supports the conclusion that '... spelling may be less susceptible than reading to environmental influences.' (DeFries 1997 p. 22).

DeFries (1997) also examined twin pairs, at Colorado University. In fact these were the same twin pairs as Olson studied (Olson 2003). DeFries chose a sample of 145 same-gender DZ twins and 195 MZ identical twins. At least one of each pair was diagnosed as 'dyslexic' (by the IQ/achievement discrepancy criterion). His data suggested that '... reading disability is partly a consequence of heritable influences' (*ibid.* p. 22). This was shown by the apparently more frequently (though not invariably) shared disability among MZ than DZ twins. The data also suggested that there is a greater influence on spelling from their genes as they age and less genetic influence on reading, or at least word recognition. '... spelling deficits are more heritable than word-recognition difficulties in older children ... spelling may emerge as the most genetically influenced literacy skill during early adolescence.' (*ibid.* pp. 22-23).

What on Earth is going on? These studies appear to indicate (though not always to a great degree of significance, consistency or power and frequently using dubiously selected sample populations) that there is at least one QTL which is at least somewhat, and at least sometimes, affecting phonological, but especially orthographic, coding (coding text to sound, but also, and particularly, to letter patterns – a function of spelling ability). They seem to indicate that the patterns of affliction among identical twins often (but not always) show that spelling performance in particular is at least partly genetically determined.

Are we claiming that there is a gene, or QTL, for spelling? How could that possibly be?

This issue raises absolutely fundamental biological questions. Biologically speaking, there can be no 'genes for literacy' *per se* (let alone spelling!). If there cannot be genes specifically for literacy, then neither can there be genes specific to 'dyslexia'. A biologist can assert this on two grounds: First, there has been nowhere near enough evolutionary time, and second, there has been nowhere near enough evolutionary pressure.

The first literate acts of our species were probably clay tablet invoices and receipts dating from about six thousand years ago (Manguel 1996, Rayner & Pollatsek 1989). In evolutionary terms this is an eyeblink. Throughout history, literacy has been both vanishingly rare and absolutely irrelevant to survival or reproduction until extremely recently, if then. It is only in the last 150 years, indeed, that a majority in Britain have become literate and many are not particularly fluently literate even now (Carey *et al* 1997). In global terms it is debatable whether a majority is fluently literate today, and it is also thoroughly debatable how important literacy is to survival or reproduction (survival of the person or the genes) for most people even now.

For a skill or aptitude to become encoded onto genes two conditions are required. Firstly, there must be immense amounts of time (in the order of one hundred thousand years) and secondly, the skill or aptitude must provide a clear competitive advantage to individuals, but across the whole population, to force the process of natural selection. If the aptitude is to survive selectively it must matter to survival and reproduction, it must be biologically important, must convey a distinct and biological advantage, and the 'selection pressure' against which the aptitude is advantageous must apply to a majority of the population for a majority of the time.

We have had some ninety four thousand years too few and, for the general population, far too little selection pressure for the encoding of any genes specific to literacy. Too few of us have been doing it for too short a time and it has been too unimportant to survival or reproduction. It would make about as much sense, biologically speaking, to propose genes specific for driving ability.

There is, and can be, no 'gene for' literacy ability, or dyslexia, *per se*. It is, though, feasible to imagine a gene or some genes affecting a more general aptitude (detailed sight, for example) which is also, in some unspecific way, necessary to, or supportive of, literacy. To say this, of course, is to say a very fundamental thing about dyslexia. It is to say that *dyslexia, if it exists at all, cannot exist as pure literacy failure.*

Dyslexia, if it exists at all, must always, consistently, be accompanied by a fundamental deficit or deficits in a more general aptitude or aptitudes which also, but only

coincidentally, relate to the acquisition and management of literacy. The 'dyslexic' will display a relative failure in some general, fundamental, neurological aptitude. He (or she) will do this consistently. In other words, the 'dyslexic' who is perfectly 'normal' in all other respects is mythical. He (or she) must, logically, have some appreciable cognitive deficit. The search for such consistent cognitive deficits accompanying 'dyslexia' continues, with wildly various results and no consensus.

A plethora of deficits and abnormalities have been proposed by researchers in recent years. They include phonological awareness deficit, magnocellular system deficit, anomalous lateralisation, abnormal symmetry of the planum temporale, weak automatization, poor motor coordination and a plethora of other neurological abnormalities. None has been proved and all are disputed. There is no consensus.

Many studies, incidentally, (and see Paracchini *et al* 2007) speculate on the actual biological effect whichever QTL they claim affects reading ability may have. What actual effect in the brain may the mutation in 'their' QTL be having? Many describe an effect on the migration of neurones during the brain's development. Known neurological syndromes are mentioned in this context, especially lissencephaly, double cortex syndrome and periventricular nodular heteropia. However, these are gross abnormalities detectable, for example, by scanning. They clearly cause many neurological symptoms, frequently, for example, epileptic seizures. They also cause cognitive deficits. It is unsurprising that, in many cases, literacy difficulties may also be seen.

In such syndromes there is gross brain damage and thus multiple deficits, only one of which is 'dyslexia'. Such gross abnormalities, even when they involve, say, reading difficulty, are not 'dyslexia' as we must properly consider it. Such cases are not the classical understanding of 'dyslexia' which has to involve an innate literacy difficulty found in people without obviously gross lesion or abnormality. A person suffering from lissencephaly, for example, is to be described as a person suffering from lissencephaly (which may, among many other gross effects, also affect their literacy abilities) but not as a 'dyslexic'.

The genetic findings, whatever they really are, amount to an admittedly disturbing aspect of the debate, for those who find dyslexia unconvincing in more general terms. I believe I can properly accept and re-assert a "general conclusion that a genetic underpinning to 'dyslexia' is far from established" (Steve Ramm, personal communication September 2007). I am not fully qualified to follow detailed genetic argument, and neither, quite probably, are you. We are both required, notwithstanding, to cling fiercely to common sense and scepticism - it is the proper approach to all

knowledge.

I believe it is early days yet. Astonishing things, with strange implications, are suggested within this field. Something is being measured by this work (though not always to a high level of significance or very consistently, not always demonstrating much genetic power, not always supported by other research, and seldom carried out in appropriately defined sample populations). What, exactly, is being measured is not at all clear, as is sometimes admitted even by researchers in the field. Whatever it is, it cannot be 'the gene for dyslexia', or 'the gene for spelling', or 'the gene for literacy'.

And finally, understanding the most appropriate way, or ways, all this work is to be interpreted remains very unclear, to say the least. What (and how much) does any of all this mean? Some are prepared to assert very extraordinary things on the basis of rather small and tentative findings, many are more cautious. (Grigorenko *et al* (2006 p. 119) say, for example, that '... we might be amazed to know how far from understanding the genetic bases of reading we actually are'. Schumacher *et al* (2007 p. 294) write that "to date no specific cognitive processes are known to be influenced by the proposed susceptibility genes".) Let us remember the wise words of St Augustine: 'For so it is, Oh Lord my God; I measure it, but what it is that I measure I do not know'.

We should also, because we have our wits still about us, briefly but firmly recall the two issues of carts and horses and affect, both of huge but studiously unrecognised importance. First the unsolved issue of horse and cart in much literacy research – when we discuss the relationship between a skill and an ability, what is cause and what is effect? It is not always clear (to say the least) whether an apparent disability is caused by an apparent skill deficit or whether the apparent deficit is caused by the apparent disability. Put another way, is my skill at orthographic coding, say, the cause of my facility with literacy or has my facility in literacy resulted in a high level of skill in decoding text?

Secondly, the consistently unremarked effect of affect on performance: The effect of emotional response and attitude on task performance is often enormous but it is usually unknown, often practically unknowable and almost invariably completely ignored for the purposes of research. Looking the other way is understandable (it makes research and interpretation so much simpler!) but it is also quite unjustified and undoubtedly skews findings and conclusions drastically, often probably fatally. This unconscious researcher bias is only occasionally recognised, as in an interesting article in a special issue of the *Journal of Research in Reading* given over entirely to reading and genetics (Conlon *et al* 2006). It remains, otherwise, elephantine but invisible.

Phonological awareness:

This is the ability to locate, separate and distinguish for what they are, the sounds in language. (And see the more detailed discussions in chapter three.) Various aspects of the detailed sounds of language are assessed by researchers - syllables, onset, rime, phonemes, consonants, vowel sounds. (Non-word reading or phoneme manipulations are common tests, for example.) The hottest candidate as I write for the 'core deficit' in dyslexia is phonological awareness. 'Dyslexics' (almost always still IQ/achievement defined) are considered to be less phonologically aware. There is indeed evidence that 'dyslexics' (or at least people with poor literacy skills) have relatively poor phonological skills. (Goswami 1997, Snowling 1995, Snowling & Nation 1997 *but* see also Ellis, McDougall & Monk 1999, Scholes 1998, Thompson 1999) There is also, though, the finding that receiving training in literacy (in an alphabetic language like ours) rapidly improves phonological awareness.

This is an important carts and horses issue; it is well aired in Goswami & Bryant 1990 pp. 4-27. (And see Adams 1990, Perfetti & Xhang 1995, Smith 2004, Taft 1991, Thompson 1999.)

Spoken language is inchoate and indistinct. To the fluent listener all (usually) seems clear enough but physical analysis of spoken language shows it to be amazingly messy and gappy. Word boundaries disappear, along with much else; sounds slur into each other or vanish altogether. Listeners obviously have, in fact, to work quite hard to make sense of it all, extrapolating from the minimal sounds offered and mindful of the context in which the speech is probably immersed. Given this phenomenal fuzziness of spoken language it is not surprising that those who do not read or write well, or often, also have poor phonological segmentation skills, nor that the latter improve rapidly with targeted tuition, nor that such improvements support subsequent spelling performance.

There is a certain circularity here: learning literacy (in English) causes phonological awareness, something only rather good spellers have.

However, the evidence does not indicate that a 'deficit' in phonological awareness skills is causative of poor literacy skills, merely that it tends to co-exist with them (see chapter three and Castles & Coltheart 2004). Poor phonological awareness does predict literacy performance but this, of course, is not the same as proof of causation, and there are also other skills which predict literacy performance, most obviously letter awareness.

The skill of letter awareness is very much less pursued in the research world but is also powerfully correlated with later reading success (Barlow-Brown and Connelly 2002, Blaiklock 2004, Gallagher *et al* 2000). 'A causal relationship between phonological awareness and reading ability has not directly been established ... performance on phonological tasks may tap into letter-based, rather than purely phonemic, representations' (Whitney and Cornelissen 2005 p. 274). And: 'The National Reading Panel's meta-analysis ... found ... that phonemic awareness instruction using letters helped children learn to read and write, but that phonemic awareness instruction without letters did not help children to learn to read and write' (Besser *et al* 2004 p. 17). And: 'We propose that preliterate phonological encodings do not include a level of representation corresponding to phonemes ... Rather, reading acquisition itself creates a phonemic representation, via linkages of graphemes to groups of phonetic features ... the phonemic encoding depends on a linkage to orthography' (Whitney and Cornelissen 2005 p. 289). And general linguistic ability itself, as you would absolutely expect, correlates with reading ability in a similar manner to letter and phonological awareness (Nation and Snowling 2004).

And this rather obvious theoretical observation is supported by research. The brain is plastic, even in adulthood (Gilman & Newman 1996, Springer & Deutsch 1997). It is changed, physically and procedurally, as a result of learning this, rather than that (Gaser & Schlaug 2003, a whole issue of the International Journal of Psychology vol. 39 (2004), Maguire *et al* 2000, Schlaug 2001). Castro-Caldas *et al* (1998), for example, found that, at the very least, '... certain aspects of the ability to deal with phonetic units of speech are not acquired spontaneously but are a result of learning to read.' and that '... learning the written form of language interacts with the function of oral language ... learning to read and write during childhood influences the functional organisation of the adult human brain.' (both quotes *ibid.* p. 1053) How could it be otherwise? (And see chapter three and Adams 1990 p. 69.)

To summarise an argument more fully rehearsed in chapter three and which reverberates around the literacy world: It has not been shown that phonological awareness actually causes literacy skills; that 'the core deficit' in 'dyslexia' really is a deficit in phonological awareness. This awareness may simply (and probably does) correlate very closely with other influences, one immediately obvious candidate being *letter awareness*. When letter awareness is examined it is found to be at least as good a predictor of reading skill as is phonological awareness. The positive effect of letter awareness on reading skill would fit well with the obvious fact that text is a visual signal and must, at least initially, be appreciated visually rather than phonologically. Text is implacably silent. We do not 'hear' it – we see it. It must be managed visually, at least to begin with. How could it be otherwise?

The magnocellular deficit theory:

This is an interesting proposal for the 'core deficit' in dyslexia. Our perceptual systems seem to be twofold - we have parvocell and magnocell systems bringing in data from the senses. The visual system is the one in which magno- and parvocells have been studied to date, but there may be similar dual systems in other modalities (for example the auditory system). A parvocell ('little cell') system delivers very detailed and exact data to the mind, presenting it with clear, complete information. The trouble is that it's slow - it takes time for the perception to reach the mind. Thus, perhaps, the magnocell ('big cell') system, which is much quicker. It won't deliver so fine-grained a perception, so complete a picture, but what it does give, it gives quickly. This can be an important advantage. Your magnocell system will, for example, tell you in good time that a sizeable object is flying through the air towards your head. Your parvocell system will, rather later, tell you that it's about 10 cm across, irregular in shape and made of rather nice grey granite with pretty patterns of reflective crystals on its surface. Horses for courses.

The speed of the magnocell system may have other, collateral advantages. When we read, our eyes stop and read, then snap along the line, then stop and read, then snap further along in the fixation/saccade routine we saw in chapter four. We need to be able to see, fixate and focus in detail, very rapidly and accurately if we are to do this quickly but competently. It has been suggested that it is the magnocell system which enables this. It has therefore been suggested that a deficit in the visual magnocell system might be a cause of reading difficulty in 'dyslexics'. (eg Eden *et al* 1996, Hogben 1997, Stein & Talcott 1999) There is some debate among those favouring this explanation as to whether the deficit is innate, perhaps genetic, and present from birth or whether it might be the result of insufficient training of the eyes below about the age of seven, at which age it is thought the system becomes more fixed and less trainable.

It should be noted that some research disputes the theory altogether (e.g. Goulandris *et al* 1998, Johannes *et al* 1996). It should also be noted that this theory involves only the visual system and cannot explain a phonological awareness deficit. 'Dyslexics', it should be further noted, are IQ/achievement discrepancy defined in these studies.

Neurology:

Reading large amounts of research on the extremely varied neurological aetiologies proposed for dyslexia can be like looking in on Bedlam. Extraordinarily multifarious claims reverberate against each other; findings loudly compete. Everyone hopes and believes they hold the Holy Grail. The onlooker is spun this way, then that. It leaves the

unwary disoriented, even queasy. On a bad day you wonder if your eyes still point in the same direction. Such reading demands that both feet be kept consciously and conscientiously applied to the terra firma of common sense. The following is but a taste:

The doyen of writers on the subject of the neurology behind dyslexia is Albert Galaburda. Geschwind and he (1987) proposed a general, overarching theory of 'anomalous cerebral dominance'. They suggested that this arose *in utero* as a result of a testosterone imbalance. Their theory, which can only be described as grand, claimed that the brain's normal asymmetry was disturbed and that this caused a vast array of disorders including dyslexia, other language disorders, autism and disorders of the immune system. Evidence is rather small, wildly mixed and the theory remains warmly disputed (e.g. Bryden *et al* 1994). Problems of measurement and definition bedevil the elucidation of the theory and findings frequently absolutely contradict previous findings. 'Dyslexics' are also defined by the IQ/achievement discrepancy throughout.

Galaburda, and others, claim diagnostic abnormalities and even outright lesions are detectable at post-mortem examination of the brains of 'dyslexics' (only eight were examined, all defined by IQ/achievement discrepancy) and some laboratory rats and mice (Galaburda *et al* 1985, Galaburda (ed) 1993, Galaburda *et al* 1994, Galaburda 1999). On the whole, Galaburda and his co-workers appear to believe that dyslexia is not a genetically determined defect, but that it is induced *in utero* or in the neonatal period. The main, but not only, contender as aetiology is hormonal imbalance, particularly testosterone imbalance. Microscopically revealed 'abnormalities' are reported from a plethora of sites in the mid and fore brains, involving, for example, '... areas of the brain concerned with perceptual processing, as well as those involved in cognitive and meta-cognitive tasks' and '... at least the visual and auditory pathways.' (Galaburda 1999 p. 183).

A recurring claim is that the planum temporale, found in the left upper temporal lobe and responsible for much language management, is 'abnormally' symmetrical in 'dyslexics'. How abnormal such abnormalities really are, if at all, is very uncertain indeed and so is how, if at all, they relate to observed abilities or behaviours (Pumfrey & Reason 1991).

'Abnormalities' are reported among 'dyslexics' in numerous living brain structures and behaviours using brain scan techniques. Hynd *et al* (1995), for example, found the genu of the corpus callosum significantly smaller in 'dyslexic' children. Duara *et al* (1991) found another area in the corpus callosum, the splenium, to be larger in 'dyslexics' than 'normals'. Larsen *et al* (1990) found 'abnormal' symmetry in the planum temporale in 'dyslexic' adults, 70 per cent of whom showed symmetry compared to only thirty per

cent in 'normals'. (Why the figure is not one hundred per cent is unclear. Nor was it shown that any of the apparent 'abnormalities' in any of these studies actually related to any difference in performance or behaviour.)

Brain scans appear to show exciting, if crude, differences between 'dyslexics' and 'normals'. A recent popular science text on dyslexia, for example, relies heavily upon them (Shaywitz 2005). However, the normal but literate brain will differ from the normal but less literate brain in important functional ways which will show up on a brain scan. This is absolutely unremarkable - they have had radically different experiences and we know that brain architecture is profoundly affected by experience. (Robertson 1999.) (And remember Castro-Caldas 1998, Gaser & Schlaug 2003, Maguire *et al* 2000, Schlaug 2001, those large straws-in-the-wind.) As we have seen, Adams (1990) Siegel & Himel (1998) and Stanovich (1991), for example, all write that reading well, and often, enhances IQ while reading poorly and little does the reverse. Remember also the *Matthew effect*, of which more later.

We need not, in fact, invoke neuropathology to explain these apparently neuropathological findings. There are other more parsimonious and credible explanations, of which more later.

It is also important to point out that scans, although they produce wonderful (and wonderfully expensive) pictures cannot really tell us about the detailed procedures within so subtle an organ as the brain. Scans are excellent for gross anatomy and visualising lesions and materially assist in medical diagnosis thereby. Their value in cognitive psychology, however, is much smaller. They may rather generally point to broadly interesting ideas on occasion, but they cannot be expected to do better than that. We cannot expect a scan, or even a series of scans, to show us the procedures which we suspect go on in our heads. These remain invisible – we have yet to film mental processes such as literacy, or love!

It is not at all clear, anyway, how far such weights-and-measures approaches to an organ as outrageously complicated, subtle and individually variable as the brain actually take us. Carts and horses are almost certainly also involved. Sample sizes, particularly when for post-mortem examinations, have been very small (or composed of rats or mice) and 'dyslexics' generally defined by the discredited IQ/achievement discrepancy criterion.

Two Sheffield researchers claim, on the basis of educational, intelligence and adapted

clinical, assessment of 'dyslexics' (discrepancy defined) to have demonstrated severe defects '... across the entire cerebellum.' (Nicolson & Fawcett 1999 p. 166). They claim, flatly, that 'Dyslexia is genetic in origin ...' (ibid. p.155) and that it is '... characterised as problems in skills automatization' (ibid. p. 171). Their battery of tests for screening adults for dyslexia includes a test of postural stability which consists of '... a calibrated push in the back.' (Nicolson & Fawcett 1997 p. 78). They claim that 'dyslexics' showed '... severe and persistent problems' with literacy but also with '... balance and motor skill' (Nicolson & Fawcett 1999 p. 156). Many celebrated 'dyslexics' would dispute this finding (not least, perhaps, Jackie Stewart, three times formula one racing world champion and a crack clay pigeon shot) as many researchers have.

This research spawned a 'therapy' to 'cure' 'dyslexia' (and more) by improving motor coordination (the DDAT treatment - Dyslexia, Dyspraxia, Attention Deficit Treatment). Many claim this therapy has proved, on dispassionate examination, to be an expensive chimera, as with so many other cures which have come and gone (Nicolson & Reynolds 2003, McPhillips 2003, Rack 2003, Rack *et al* 2007, Reynolds *et al* 2003, Reynolds & Nicolson 2007, Richards *et al* 2003, Singleton & Stuart 2003, Stein 2003, Snowling & Hulme 2003).

And, in the context of disputed findings, perhaps the infamous '*publication bias*' effect ought to be mentioned. This bias refers to the very human desire to read, and publish, findings rather than non-findings. A large number of studies do not find what others have purported to; they do not support other work. In some cases these studies may be published, but often they are so boring (they may have found absolutely nothing of significance) that they are either not submitted at all or are not published. Editors of journals are human and they operate in a marketplace. They naturally tend to seek the stirringly conclusive rather than the enervatingly inconclusive.

It is interesting to publish an article with an exciting new claim - for example perhaps that 'dyslexia' is caused by a previously unconsidered influence such as the amount of daylight we experienced in our first year of life. The subsequent research that finds that this isn't really the case, that there is no relationship between early exposure to sunlight and later literacy ability, is dull reading by contrast. It may never see the light of day, and the original claim will stand, by default, and be referenced in other writings. It may become accepted as 'truth', at least for a time. (A. N. Other *et al* have shown that ...)

The precise size and nature of this publication bias is not clear, of course, but it exists, may be large (perhaps especially in a field like dyslexia) and considerably affects what we consider to be 'reality'. We might take less as read if we were able, in fact, to read more. (And a recent study claims that over 50% of studies produce findings which are

later found to have been wrong! Oh well ...)

To say that this theoretical area - the neurology, or neuropathology, behind dyslexia - is unresolved is an understatement. No theory has reached anything approaching consensus and theories which have been cross-examined through research are frequently not supported, or not strongly supported. Scepticism and patience remain proper attitudes towards all this research.

Scotopic sensitivity or the Meares-Irlen syndrome:

I once met a lady who wore plain, very pale yellow spectacles when reading. She told me that she was dyslexic and was convinced she could not read any but the simplest of texts without them (they were not lenses but absolutely plain glass). With her spectacles on, she read even academic texts absolutely fluently. She had tried many different colours, all of which helped about equally, she said. She had plumped for yellow simply because she liked yellow.

Irlen lenses (which are plain but colour tinted spectacles), or coloured overlays (which are clear but colour tinted plastic sheets) sometimes, as in this case, have instant and stunning effects on the ease of reading. Sometimes the effect is small and sometimes there is no effect at all. (Irlen 1991, Tyrell *et al* 1995.) A useful, short review of research is Whiteley & Smith (2001). Some writers assert that it is 'dyslexics' who are helped by these lenses, or overlays. However, writing in the same volume of the *Journal of Research in Reading* as Whiteley & Smith, Wilkins *et al* (2001) report finding that around half of 'normal' schoolchildren in their three samples experienced reading as easier, and did it better, through coloured overlays; some individuals improved by over thirty per cent. They found that 'A substantial proportion of children reported symptoms of visual stress...' (ibid. p. 50) and it was particularly these children who improved most, and most reliably, when using their preferred colour overlay. Symptoms of 'visual stress' included letter movement, text blurring and uncomfortable brightness. Almost a third of those who noticed improvement were still voluntarily using their overlay at the end of the school year, eight months after being introduced to it.

The effect is most gratifying, and when it works, it really works. Nobody knows why it should. Wilkins *et al* (2001) speculate that as 'visual stress' is reportedly more common among migraine and epilepsy sufferers they may all be due to a 'hyperexcitable visual cortex'. Scotopic sensitivity syndrome (or Meares-Irlen syndrome) is a syndrome of the visual system. It is not specific to literacy though capable, apparently, of dramatically affecting it. For 'dyslexia' to have any meaning it must be a syndrome which is specific to literacy - not a syndrome relating to sight in general, for example. The sometime

success of Irlen lenses or coloured overlays at alleviating reading difficulty is clearly significant, when it is, but leaves the dyslexia debate approximately where it was before they came along. (Kriss & Evans, 2005, Singleton & Trotter 2005).

Robinson and Conway (1988, unpublished) reported significant improvement in subjects using Irlen Lenses in a wide range of school, basic academic subjects, reading comprehension, reading accuracy, but not in rate of reading. Adler and Axwood (1987) evaluated the results of Irlen Lenses on 23 remedial high school students and a matched control group. Significant improvement for the experimental group was noted for time needed to locate words on a printed page, timed reading scores, length of time for sustained reading, and span of focus, as well as other perceptual tasks. Additionally, seven of the 23 experimental found employment, but none of the control group was employed by the end of the semester.

In contrast, Winters (1987) was unable to find differences in this study. Winters gave 15 elementary school children four minutes to locate and circle 68 examples of the letter "b" on three pages, each page of which contained 600 random letters in 20 lines of

Figure 8.1 The 'swirl effect' – as reported in the Guardian newspaper 17th October 1995.

The 'swirl effect':

Not so many years ago the 'swirl' and 'see-saw' effects were widely reported and regarded as pathognomic for 'dyslexia'. Oddly, they are not commonly reported any more. The story went like this. For some 'dyslexics' text appears to swirl so violently about as to be unreadable. Some report a 'see-saw' effect, where lines of text move wildly up and down such that nothing can be made of it. These appear to be genuinely experienced effects, once regarded as typical, even diagnostic, of dyslexia so let us have

a look. For a swirl effect, for example, to be actual, one of only two things can be happening – either the visual system is distinguishing text from all other visual stimuli in order specifically to swirl only text around or to the unfortunate person everything swirls about. This latter is not reported and it would, of course, hardly be possible to live if it did.

How can we otherwise explain the swirling of print? Could it be an *affectively* mediated effect? Is so much anxious stress associated with the intensely personal demands of print that it comes to feel as if it swirls, or jumps about, or is in some way inherently unreadable? It cannot, in an otherwise normally sighted individual, really be doing so. Is this an unconscious self-defence, transferring responsibility from the individual to his physiology? (and see Martin 1989 p. 53 reporting that when he has to play the piano in front of his teacher he sweats and freezes, and the notes seem to jump around on the page before him). Or Johnston: ‘In my view the effect of anxiety in reading difficulty cannot be over-estimated.’ (1985 p. 167).

The profound effect of affect (e.g. anxiety, or stress) on literacy has been described in the previous chapter. In their report on ‘Dyslexia, literacy and psychological assessment’ the British Psychological Society (1999) asserts that

Emotional difficulties can be associated with dyslexia. Whilst these affective responses are not the causes, but rather the consequences, of dyslexia they may contribute to, and exacerbate, learning difficulties in a complex and incremental way. (p. 45).

They produce no evidence for their assertion that such damaging negative affect is a consequence rather than the cause of the ‘dyslexia’. They refer to Pumfrey and Reason (1991) who do not, in fact, make this assertion. Pumfrey and Reason produce evidence for both possibilities and are at pains to point out the equivocal nature of the evidence. They assert that ‘dyslexics’ usually show considerable, sometimes dramatic affective disturbance related to their learning difficulties, while concluding that whether affect is horse or cart has yet to be elucidated. Everyday observation, as well as intuition, tends, in fact, to back the horse.

It has been my experience (and see chapter 7) that emotions and feelings are intimately involved in odd literacy difficulties and that they have usually been more cause than consequence of said difficulties.

The word-processor by-pass:

This phenomenon is commonly observed but never appropriately remarked. You will probably have heard or read something like this more than once, for yourself: 'I am dyslexic and for me this means I literally cannot write my own name *but I can read quite well and I am now using the word processor.*' (Herrington 1995 p.7 my emphasis). It is astonishing how often 'dyslexics' are said to enjoy a straightforwardly usual degree of success on the word processor while experiencing ongoing difficulties with a pen. However, assembling language and spellings for word processing and for handwriting are, of course, exactly the same cognitive process; the only different is the different hardware through which the act is mediated. Word processing involves precisely the same cognitive literacy domains as handwriting does; it is simply the eventual choice of expressive tool which differs. In such a case the diagnosis must be at fault - the 'dyslexic' who makes ordinarily good progress on the keyboard does so because there is no such corrosive personal history or expectation of failure associated with the keyboard as there so manifestly is with pen and paper. With luck nobody has told him that he will also be 'dyslexic' on the keyboard, so he isn't. The change of technologies has by-passed all that affective baggage. And, of course, if he is 'normal' on the keyboard, he is 'normal' full stop.

I will recount an anecdote which may be interesting in this context: I know a man who stammers. He is a highly intelligent, very pleasant and witty man, but he stammers so badly that he finds it almost impossible at times to make himself understood. It can take him a minute or two to get through a single sentence. However, this man is a very talented amateur actor; he regularly takes the leading role in the annual pantomime put on by the high quality local theatre group. He is given the lead because he is outstandingly entertaining not only when delivering his lines as the King of Llanastraw, or whatever he is this year, but also, and particularly, at the uproarious final performance, striding to the edge of the stage and ad-libbing with the audience to stunning effect. He invariably delivers a tour de force, sometimes at length - and he never stammers at all on stage. The show can take anything up to an hour longer than usual because of his interactions with his audience, who love every bawdy minute of it.

In his ridiculous role, swathed in a stupendous costume, he commands the theatre, declaiming with perfect fluency and responding devastatingly and swiftly to the heckling rising from the seats below him. In front of exactly the same people come to worship him at the famous post-performance party a few minutes later he will be stammer-bound. Does becoming a king (as he demonstrably does) by-pass whatever trauma, whatever complicated language-associated affect, so profoundly interferes with his speech when he is merely himself?

Cognitive or learning styles:

The neurological deficit explanation of 'dyslexia' is intermittently questioned quite critically. Some researchers seek to replace a medical deficit aetiological explanation with one of different, and differently appropriate, cognitive styles. They claim that we all have radically different minds, with inborn differences of behaviours and aptitudes, rather than that some of us have apparently abnormal brains. Herrington (2001), for example, reviews the field in the context of remediation of adult 'dyslexics' in ABE. She specifically rejects the 'medical disability' view in favour of a '... different thinking/learning style' (ibid. p. 13), while still considering that '... all intractable difficulties with aspects of literacy involve some elements and degree of dyslexia.' (ibid. p.17). The 'learning styles' approach asserts that different people have radically different underlying cognitive styles. They approach learning, in particular, in radically different ways. The further claim is usually made - explicitly or implicitly - that these different styles are innate, are hardwired into the brain by nature (as opposed to learned during nurture). It is important to remember that these claims remain controversial and unproven, of which more a little later.

It is often alleged, frequently without rigorous evidence and on the basis of only a case or two, that 'dyslexics' have special attributes perhaps in compensation for their special difficulties. This is a lovely, warm idea. Unfortunately it is probably only that. Herrington's review of the literature concludes that the case for 'dyslexics' being unusually blessed with particular aptitudes (such as enhanced visuo-spatial skills) to extraordinary degrees is weak. Her own analysis of 'dyslexic' ABE students' subjective reports, however, leads her to suggest that they nonetheless approach literacy from unusual perceptual angles. Some, she claims, say they experience, or need to experience, meaning in written or spoken language visually and graphically - as picture or at least metaphor - before understanding it. They report that they are obliged to 'switch modalities' to find meaning. They also report that their difficulties with literacy are specifically related to the difficulty they experience trying to grasp, or express, meaning in the inexorably linear and sequential medium of text. Memorisation is often anecdotally reported as particularly problematic for 'dyslexics'. Herrington claims 'dyslexic' ABE students often report that their efforts to memorise demand visualisation. These students report that they find it difficult to memorise ideas linguistically but can memorise them as visual images. Even more controversially, perhaps, she asserts that 'dyslexics' may experience time in unusual ways, sometimes as 'a total blank' or 'as if it is a separate dimension' (ibid. p. 22).

The thesis that some people have radically different cognitive styles from the majority of the population, and that these are innate, remains highly speculative (Coffield *et al*

2004 is a useful and appropriately critical review). Many schemes for assessing learning style are aggressively marketed and much money is made from this presently fashionable theory. Sadly, the science is correspondingly selectively reported and truth obscured. The crucial educational question, seldom properly addressed, is to what extent these different learning styles really exist and genuinely relate to underlying and innate cognitive styles, and to what extent they may have been adopted, induced, learned or taught.

To what degree is a 'learning style' natural and to what degree may it be learned? This difficult and inconvenient, but educationally fundamental, question is not well understood and is generally, but absolutely improperly, ignored. Many students indeed appear to have strong preferences for learning in particular ways - for example many students seek to master literacy purely phonically, regarding literacy solely as a matter of 'sounding out'.

A learning style advocate will conclude that such a student has an innate bias towards learning through phonic attack; that they experience and learn best through sounds. A sceptic will want to know whether this bias is really innate or whether it has been learned (Johnson 1985)? May the student have learned that phonic attack is the only way to do it? Have repeated patterns of success and failure, and insistent teaching approaches, taught him his 'style'? Indeed, Johnston & Allington (1996 p. 999) quote Barr as saying that

... whereas more able readers show little trace of instructional method past the second grade, less able readers appear to learn narrowly what they are taught; indeed they tend to show quite marked effects of their instructional focus.

A fundamentally important educational dilemma immediately arises from all this. If the learning style a student appears to exhibit is genuinely innate, that is to say that if his brain really is hardwired to operate in that manner, then his learning had best be done using this style. However, if the student has merely learned to use this style then he is missing out on, and must urgently be taught, different styles. Instead of reinforcing a single, learned cognitive style and thereby restricting our student's repertoire we should encourage him to learn and use a variety of approaches, as we do ourselves. If a style really is innate, then we should teach to it. If, however, it is a learned style we should do precisely the opposite.

It has been my experience that students invariably (and I mean invariably) benefit from deliberate exposure to learning approaches at variance to their apparent 'learning style' - by learning, and learning to deploy, a more varied range of approaches to their literacy

(see notes to chapters four, five and seven). The student, for example, who employs only phonological attack, the student who doggedly 'sounds out', needs practice in visual approaches. It has been my experience that absolutely all such students do indeed learn, willingly deploy and benefit from, such different 'styles'; an observation which leads me to conclude that their apparent 'learning style' was itself learned rather than innate. Fluent literates in the real world do not rely on a single approach to literacy, a single 'literate style', why should a student?

So, it remains unclear whether there really are significant, and significantly different, learners who consistently rely on radically different learning styles based on innate cognitive styles. At an immediate, educationally practical level the recognition and exploitation, or management, of various cognitive and learning styles may (or, as we have just seen, may not) be good practice. It remains questionable whether variation in cognitive style will ever offer a satisfactory alternative explanation for 'dyslexia' or much in the way of genuine, useful pedagogical insight.

Is there any alternative to 'dyslexia'?

The question everyone asks when faced with scepticism about dyslexia is "Well, what is it, then?" To which the opening reply must be that there is no single "it" for it to be. There are so many other, more prosaic explanations for peculiar difficulty with literacy, each more likely than a highly selective miswiring of the brain. (And 'Occam's razor' springs to mind.) A professor at London University's Royal Veterinary College forty years ago used to cry, in exasperation, "Common things are common!" - and so they are. He meant to drive home that a clinician has no right to diagnose the rare and esoteric until the everyday has been considered and eliminated. What is sauce for the clinician is sauce for the educationalist (and everyone else too). I am about to run through a mass of quotes, each of which, I hope, illuminates a particular reason for literacy failure. This is the stuff of everyday; much less scientifically exciting (and much more probable) than a neurological 'dys'. For exactly that reason, these, or other, explanations are much more legitimate early proposals in our quest for a 'diagnosis'. This list of possible causes is, incidentally, certainly not definitive, you will have many revealing quotes and further ideas of your own.

'Reading and writing are not just cognitive activities – feelings run through them.'
(Barton 1994 p. 48).

'Her reading problem was mostly the fear that she really couldn't learn to read and the shame she would feel if this proved to be so.' (Holt 1982 p. 37).

'While I was at school I was educated to feel shame and worthlessness, to feel doubt in my own abilities and self-hatred. I was educated to feel small and worthless.' (Miles & Varma 1995 p. 65).

'It is their intelligent response to a perceived problem that appears to prevent them from developing normal reading behaviours.' (Johnston 1985 p.165).

'Bog off! I ain't reading that babby stuff!' (Martin 1989 p. 1).

'The more I thought I couldn't do it the worse I went!' & 'You couldn't do it anyway so you didn't try.' (Newsham 1988 pp. 15 & 16).

[you learn to] '... do something else, that's to deceive ... mainly yourself.' (Mellor 1988 p. 42).

[the poor readers] '... got beat more than anyone ... they got more stupid by every day.' (in Goleman *et al* 1984 p. 46).

'There was a terror campaign waged against me to get me to spell properly.' (Miles & Varma 1995 p. 65)

& [all quotes from a variety of ABE students]

'The teacher was only interested in those who were bright.' (this one, sadly, comes up all the time.)

'There was over forty children in her class - she had no chance.'

'I never had stories read to me.'

'There wasn't a book in the house.'

'Where we lived, in the country, there was no kids - I just mucked about in the mud.'

My favourite, from an African-American brought up around Alabama, reads: 'I went to school on the days it rained.'

And there are, of course, many more where they came from - complexity & wisdom enough without recourse to neuropathology. (and see Arnold 1994, Stanovich 1986, Tizard 1993, Tizard & Hughes 1984, Wixson & Lipson 1996.)

The Matthew effect:

In a long and rewarding article Keith Stanovich (1986) writes that ‘... the cognitive consequences of the acquisition of literacy may be profound’ and that ‘... the knowledge base of less skilled readers may be less developed because of their lack of reading practice’ (both quotes from p. 374). Learning (and using) literacy may make for greater cognitive ability and increase our ability to catch, and hold, ‘information’ including literacy itself. Using literacy reinforces literacy. On page 380 Stanovich also says that ‘... a strong bootstrapping mechanism that causes major individual differences in the development of reading skill is the volume of reading experience’. Those who are good at something will do more of it; those who do more of something get better at it and do more of it... Especially is this so with literacy. The good reader in, say, middle school, reads several millions of words a year, whereas the poor reader reads only a few thousand (and probably hates every one). We all know what practice makes. This is the ‘Matthew effect’, an extremely important, but often overlooked, factor in literacy acquisition and maintenance, as well, perhaps, as in much more general cognition.

Stanovich attributes the invention of the term ‘Matthew effect’ to a science teacher called Merton, who took the name from the gospel according to St. Matthew XXV: 29, ‘For unto every one that hath shall be given, and he shall have abundance; but from him that hath not shall be taken away even that which he hath’.

In other words, and this applies to literacy in spades, the more you do the better you get and the more you can, and probably will, do. The rich get richer while the poor get poorer. The simple fact that less literate people read a great deal less than more literate people makes it more difficult for them to progress. It may even skew their cognition in ways which may make it more difficult again. It will lower their measured IQ. The practice of literacy delivers better literacy and easier literacy which, in turn, delivers more practice – how could it be otherwise?

We do occasionally see cases of apparently odd difficulty in acquiring and using literacy. On any but the most blinkered, partial or superficial view it is obvious that there must be, and are, many different reasons behind these cases. There is no space here to do more than hint at a few of these reasons and indeed there has been scandalously little research done in the field of non-neurologically induced literacy difficulties. We can all agree that every individual with literacy difficulties will have a particular history in respect of literacy and the learning thereof. However, it has been my experience that most of these histories have many things in common. They often include some or all of the following (which is certainly not intended to be an exhaustive list):

- Relatively little (sometimes no) literacy activity in the home, and/or relatively little, and relatively undemanding, linguistic activity there (e.g. Hart & Risley 1995). This means that he (our student) will reach the school world with more ground to make up before he slots in with the rules of the game there and the rather particular linguistic skills he suddenly needs.
- Very early failure in school. This may be due to linguistic or literate unpreparedness, as mentioned above, or perhaps that all- important spring from the starting blocks may be hampered for more interpersonal, familial, environmental or cultural reasons. This early failure will be officially noticed, after a while, although our lad will already, long since, have felt its icy draught and the first twinges of dread.
- Both he and his helpers (or, as they may appear to him, his inquisitors) may find his failure bewildering, intimidating and frustrating. Everyone's feelings may become very intense, if largely unexpressed. The little victim may exaggerate parental and teachers' emotions and opinions - he will certainly be acutely aware of them. He is intensely mindful of the importance of his failure and understands that it says large things about him. He internalises the general anxiety and may translate it into opprobrium.
- Either the educational system begins to side-line him, claiming him as a struggler and allocating him his place at that table at the back, or remedial action begins. This latter may be at least somewhat inappropriate and only intermittently successful. Ground continues to be inexorably lost, at any rate. Literacy is experienced as impossibly difficult, incomprehensible, intimidating and humiliating.
- Confidence in literacy, and ability, fades. Literacy becomes an unpredictable menace, a source of pain and dread. There is no pleasure to be had from it. Strategic straws which occasionally deliver the right answer are grasped and doggedly adopted, which often means that ridiculous things are written or read. Strategies which once succeeded are hugged and deployed stubbornly in every circumstance. Their occasional success reinforces their clutch, but their intermittent failure entrenches incomprehension and anxiety. He becomes (in literacy terms at least) highly risk-averse, further draining motivation, engagement and the ability to learn or perform.
- At a later stage of his school career, in secondary school, he may be subject to further remediation, to 'special needs' provision. He feels (probably correctly) that it is all too late. Since he is 'special', 'special' methods are used. These may inculcate rigid and restrictive approaches to literacy, and inappropriate strategies. They may seem to our student to be odd, simplistic and repetitive, even infantile, further depressing his confidence and motivation. They seem to fit with the opinion he feels everyone,

including all his most 'significant others', must have of his abilities. He feels (and is) labelled, publicly and privately. He resigns himself to being 'thick' and departs from education as soon as he is able. He will not lightly return.

Is dyslexia benign?

I have recently been sent a mailing among which was an advert for an adult dyslexia organisation. This took the form of a bookmark with their website address on it and a cartoon at one end. This depicted a tiny man, the corners of his mouth turned down in utter misery; his eyes wide open in sorry bewilderment, his fingers hopelessly clutching the window ledge in front of him. The window he peered so desolately out of was that of a prison cell. The bars of the window were made of oversized pencils, tall and bulky, completely dwarfing the demoralised, defeated, and presumably dyslexic prisoner. Escape looked remote and improbable - on the evidence of the cartoon impossible. The message was clear. This is how it is to be dyslexic! This is industrial strength learned helplessness, being powerfully transmitted.

In chapters six and seven we looked into affect. We saw how important attributions can be and how they can contaminate the unconscious; that maladaptive attributions can induce learned helplessness and that they can do this in teacher or student or both. In educational contexts a maladaptive attribution is likely to be the attribution of failure (or difficulty) to innate and irremediable causes, to something we cannot do much, or anything, about. When we diagnose 'dyslexia' we are attributing failure to a deficit, to an unfortunate kink in the brain. Dyslexia is innate (it's the victim's problem, it's their hardware that's at fault). Dyslexia is also mysterious and irremediable (we have no idea how, if at all, we could repair this hardware; we're stuck with the fault).

Attributing literacy difficulty to such a debilitating cause disempowers, and learned helplessness is exactly such disempowerment. Occasionally it is consciously apparent as in 'I was very unhappy. I was told I'd never be able to read or write - I was told this by an educational psychologist.' (Open learning project p. 37). Or as one unfortunate 'dyslexic' remarked '... our minds are wired differently ... the result is we've ended up with muddle in our minds.' (Miles & Varma 1994 p. 58.) Sometimes helplessness is also carefully and consciously transmitted to the hapless student as in a widely distributed book purporting to enable 'tutors in adult, further and higher education' to diagnose dyslexia:

Dyslexia is a disability or specific learning difficulty which needs to be identified and clarified with the student. This is not because of some desire to label

students but because students need to understand that their difficulties will not go away with tuition, practice, hard work etc. (Klein 2003 p. 82.)

A student is quoted in another book widely disseminated among teachers of literacy to adults (Lee 2002 p.22). This student, Clive, writes a poem called 'Dyslexia' and it contains these lines:

Only myself to blame
A life sentence
My heart sobs at the news
I am a prisoner for a crime I have not committed
Will I ever be a free man?

It seems likely that the unfortunate Clive has already concluded that the answer is probably 'No'. Indeed, after being told that he has a neurological deficit, a permanent and irremediable disability, how could it be otherwise?

As A. A. Gill says, in the Times of August 12th 1998,

'Dyslexia now has a cachet. It has become fashionable. But there is a real danger here. By pinning this label to all their children parents are giving them a ready made excuse to fail.'

Is a diagnosis of dyslexia, then, always and necessarily, a neutral or benign thing? Does it not also have a subtle but powerfully malign effect all round? Learned helplessness, or disempowerment, associated with maladaptive attributions, among ABE students is well documented (Charnley & Jones 1981, Du Vivier 1992, Levine 1986, Mace 1979, Wallis 1995). Learned helplessness among ABE tutors faced with 'dyslexic' students has also been documented (Kerr 1999 & 2001(b) and see notes to this chapter). Given the clear maladaptive attribution that a diagnosis of an innate and irremediable neurological handicap, or disability, inevitably is how could it be otherwise? (Bar-Tal 1984, Chan 1994 & 1996, Fang 1996, Johnston 1985, Muthukrishna & Borkowski 1995, Peterson *et al* 1993, Stanovich 1986.)

Maladaptive attributions engender learned helplessness. Dyslexia, whatever else it may or may not be, is a maladaptive attribution *par excellence*. It will, inevitably, engender learned helplessness. How could it be otherwise?

And it is precisely the inevitability of learned helplessness that renders 'dyslexia' so dangerous; so damaging to its victims.

To reiterate from three important sources: ‘... teachers who believe that ... lack of ability is a stable state will produce a debilitating environment’ (Fang 1995 p. 51). ‘Dyslexia’ is, by definition, a stable state.

‘The attribution of failure to a cause for which there is little hope of a cure is profoundly unmotivating’ (Johnston 1985 p. 170). There is, by definition, no hope of a ‘cure’ for ‘dyslexia’. We may alleviate symptoms but we cannot locate, or alter, their neurological cause.

‘The belief that most learning problems can be blamed upon the student militates strongly against the student’s best interests’ (Westwood 1995 p. 21). ‘Dyslexia’ is, by definition, absolutely the student’s problem. It is due to a mysterious deficit which belongs entirely to the student.

To put all this into plain language, to call a spade a spade, we would have to say that the ‘dyslexic’ student’s difficulty with literacy is solely due to there being something wrong with his own brain. We cannot agree precisely what is wrong and we cannot fix it. The affliction is permanent. We know that this information will deflate and demotivate, but there it is.

Adding to their sense of difference, doom and deficit, many ‘dyslexics’ are removed from the mainstream for special treatment. Having ‘diagnosed’ this impenetrable deficit, having marked these people out as radically different in some as yet mysterious cognitive way, we do not, of course, expect our tried and tested teaching and learning methods to work. If we claim that these people are neurologically special it is plain they will need special handling. Methods laboriously refined over the years and successfully used in the mainstream, on which we have consensus and which we clearly understand, will not do. In the words of Jenny Lee ‘Very few basic skills courses are appropriate for dyslexic students’ (2002 p. 6).

‘Dyslexic’ teaching involves a highly particular attitude and methodology. There is a distinctive flavour to the methods routinely used with ‘dyslexics’. Students are encouraged to remember their special difference at all times. They are told they can only learn material if it is presented in a highly structured manner. Their learning, they are led to believe, demands far more repetition than ‘normal’ people’s would (dyslexia remedial schemes overtly demand massive over-learning).

Remedial approaches also commonly entail thinking overtly about the formal detail of language and literacy – the ‘rules’ - the ‘dyslexic’ mind not being trusted to learn directly, unconsciously, as yours and mine did (see notes to chapter 6). Strange things

like vowel digraphs, consonant blends, even heterophonic homographs and heterographic homophones, things the rest of us learned (if at all) only after the event, only once we were already fluent, are deliberately foregrounded and drilled. Everything is drenched in esoteric terminology, and obscure rules; learning becomes technical and highbrow, compellingly redolent of school and its least comprehensible lessons.

Literacy, especially spelling, is approached through phonics and as a rule-based activity - 'G usually says /j/ when the next letter is E, I or Y.' (Hornby & Shears 1980) or 'Words of one syllable ending in F, L or S double that letter after a short vowel.' (Pollock 1980) or 'In one syllable words with a short vowel sound we must double the last consonant before adding an ending beginning with a vowel.' (Allan 1977) or 'We need to keep the first vowel short when we add *ing*, so we must prevent double vowel power by adding an extra consonant wall (Lee 2002). Grammar, and its 'rules', are explicitly taught and are similarly jargon-dense.

There is huge demand to memorise the inherently unattractive and unmemorable. Nothing can ever be done without strenuous, and conscious, thought. Accuracy in detail is particularly demanded and stress is considerable as a result. Learning becomes a grinding, drill-based, rule-based affair. There is small room for creativity and meaning. Any literacy skill being learned becomes itself the goal of the learning; the purpose of literacy becomes deployment of its skills rather than the realisation of meaning or art. Literacy becomes a matter of encoding or decoding. Tiny details are endlessly rehearsed. Literacy is ingrained as painful quandary rather than as liberating tool.

Tuition designed for 'dyslexics' is usually aggressively (and overtly) prescriptive, technically complex, busy, stern and inquisitorial. It demands constant, fraught intellectualisation. Believers buy into this; sceptics blench. Control is entirely in the hands of 'experts'; the student is absolutely disempowered. There is an explicit assumption that the mountain is peculiarly high and the road peculiarly rocky. They will be.

A diagnosis of dyslexia may thus function at several different levels and as several different things. On the political level it may be power; once the diagnosis is given there may be privileged access to funding and educational doors may be forced open. On the personal level it may be an alibi explanation, sparing blushes and providing a socially acceptable protection against disgrace and shame. On quite another level, though, it will act as a potent, but unremarked, handicap in the learning of literacy, inducing and entrenching learned helplessness all round. And developmental dyslexia remains controversial and may yet prove to be non-existent. It may even be all four of these very different things at one and the same time.

Dyslexia is politically very powerful today. '... the media have accepted (why I wonder?) that the case is proven.' (Martin 1989 p. 19.) The teacher of adult literacy works in an environment where public, management and student all accept the widespread reality of dyslexia. The teacher is obliged (by law, in the UK) to accept that it is a real neurological disability, and to act upon a 'diagnosis', even though many find it unconvincing. And dyslexia seems so emollient. 'Anything so convenient must be right.' (Galbraith 1962) Dyslexia is nothing if not convenient; it blames the victim, which is such a comfort to everyone else.

'The most important purpose of education may be the inculcation ... of a deep, even raucous, scepticism.' (Galbraith 1962). In part because it is so suspiciously convenient, but also because it may be a subtly but profoundly damaging diagnosis of a condition which may itself be illusory, developmental dyslexia surely merits Galbraith's 'deep, even raucous, scepticism.'

What should we do?

Notwithstanding all the appropriately sceptical above, of course, literacy teachers are commonly faced with students with officially sanctioned diagnoses of dyslexia, sometimes of severe dyslexia. What do you do, if you are unpersuaded?

You have three choices: you may challenge the diagnosis, reinforce it or ignore it. What do I do? I am thoroughly unpersuaded, as you have seen, but even I cannot say with absolute certainty that dyslexia does not exist. We all remain too ignorant as yet for dogmatism. For this reason, and also because the diagnosis (at one level and at this moment) may be helpful to the student (it's certainly better than being regarded as unintelligent), I do not recommend a direct challenge to the diagnosis. Neither, though, do I recommend it be accepted – this will reinforce the disability fantasy (which I believe dyslexia to be) and will, to the exact degree that this fantasy is accepted, induce learned helplessness.

I am therefore driven to the third way; the 'Mmmm...' approach. When told a student is 'dyslexic' I say 'Mmmm...' and then teach as if the diagnosis had never been made; I treat the student as completely 'normal'. I dismiss dyslexia from my own mind and soon the student will feel it fade from his too. Dyslexia, it has been my experience, eventually withers into forgotten insignificance. It is at this point that educational progress can really begin.

A conclusion, of sorts:

If we could run time forward, what might we see?

Cruising the electronic archives in, say, the year 2050, we may read that a gruelling educational controversy rumbled on for many years each side of the millennium in respect of what we called 'dyslexia' at that time. Thankfully, we will note that we have been able to resolve this issue or, as it turned out, these issues. We will see that a lot of what seemed to be evidence for one thing was really evidence for many others. We will read that the hoary and mystifying syndrome we once called 'dyslexia' turned out to be a mix of various social influences, whose reality we were reluctant to admit, and a few neurological deficits, none of them specifically related to literacy.

We will see that part of the problem was that literacy was regarded as so important that passionate and sometimes inappropriate pressure was unwittingly applied to early learners in the days before the real nature and purpose of education was fully understood. We will note that many people, in those days, developed affective defences against, and thereby sometimes extraordinary responses to, literacy, often to the process of education itself. It will pain us to read that many people were considerably intellectually reduced as a result. As well as this, though, we will read that we understand better those few neurological syndromes, which, although they are not specific to it, may secondarily affect literacy.

'Dyslexia' will have joined the many psychological ideas which seem faintly embarrassing now, but which once seemed so straightforwardly commonsensical. It will lie, mouldy and neglected in the attic of psychological history, alongside the homunculus, the phrenology head, the ink blot and behaviourism. If we should ever catch sight of it there, among the invigorating but wrong ideas of previous times, we will recognise it as just another casualty of dogged scepticism and the scientific method.

Chapter one notes.

Ecological psychology and split-brain research.

Ecological psychology.

I will begin these notes with an extensive quote from Costall (1995 p.467) as follows:

According to the American humorist Robert Benchley, there are two kinds of people - those who think the world can be divided into two kinds of people and those who don't ... there are two kinds of psychologist - those who know they are committed to some form of dualism and those who don't. Certainly, there are more than two kinds of dualism. There are the dualisms of the mental and the physical; of the knower and the known; of mind and body; mind and behaviour; organism and environment; of quantity and quality; of fact and value; of subjective and objective; of individual and society; of natural and conventional; and of biology and culture – to name but a few. Together these dualisms appear as a problem special to psychology because each cuts right through the discipline. Yet psychology, as a modern, academic discipline, did not create these dualisms, but was created by them. Once physical science had promoted its methodology (of atomism, mechanism and quantification) to an exclusive ontology, psychology was a pretty obvious mistake waiting to be made - an essentially derivative science modelled on physics, yet having as its subject the very realm that physics rendered utterly obscure.

Costall says that '... one of the most fundamental issues of modern psychology ...' is '... the *reality* of meaning.' *ibid.* p. 468)

I like the phrase: '... psychology was a pretty obvious mistake waiting to be made' inordinately. However, I obviously also feel that it overstates the case somewhat or I shouldn't be writing this book. Costall was writing a paper based on the ideas of James Gibson who first wrote about 'ecological psychology' (e.g. Gibson 1986). Ecological psychology is all about what Gibson called: '... the complementarity of the animal and the environment'. (*ibid.* p. 127). For the purposes of this discussion we are 'the animal'.

Gibson writes that what we actually experience is 'affordances'. We do not experience

things as things *per se* but as whatever they 'afford' us. We make meaning, rather than identify stuff. 'To see things is to perceive what they afford' (ibid. p. 240). Perception is an active process; it is a creation of the individual, a construct formulated within a wide-ranging perceptual system. Perception is '... an achievement of the individual, not an appearance in the theater of his consciousness' (ibid. p. 239). (The idea of the 'theatre of consciousness' arose with Descartes. He thought there must be a conscious mind, sometimes conceived of as a tiny homunculus, watching what was going on in the mind & hence the world, as if in a tiny neurological theatre. 'We' must be looking at 'it'. This Cartesian dualism is rejected by modern thinkers in psychology. There is no little person watching the drama in this theatre; there is no theatre; the drama and the mind are not separate; they are a single entity.)

'The inputs of the special senses have the qualities of the receptors being stimulated, whereas the achievements of the perceptual systems are specific to the qualities of things in the world, especially their affordances' (ibid. p.246). Some of these 'qualities of things' relate to persistence and change. We '... extract the invariants of structure from the flux of stimulation, while still noticing the flux' (ibid. p. 247) Our perceptual systems do not passively match incoming data to stored memory data, we appreciate affordances, invariances and transformations in input/output feedback loop systems which may involve swathes of our brain, and many and various centres there, in our proactive search for meaning in our environment. Meaning is all.

Gibson claims that the modern dualism which sees items of 'information' from the environment being passed passively along neural pathways to the brain, an essentially passive recipient, to be mechanistically matched against items already in the brain, and a meaning mechanistically and passively reached thereby, is fundamentally misleading. All of psychology, he says, must look to its laurels. He claims a fundamental philosophical flaw in dualism.

Wemelsfelder (1997), repudiating Cartesian dualism, which '... defines subjective awareness as 'introspection', or the capacity to think' (ibid. p. 69), ('*cogito ergo sum*' & all that Cartesian jazz; a mind separate from body and the world around) speaks of 'integrated awareness' and says that behaviour (and learning is one kind of behaviour) '... is not the result, but the source of perception.' She also says (1993 pp. 70 & 71) that 'subjective concepts denote an active, attentional mode of behaviour' and that

'... attentional abilities ... endow behaviour with an active, anticipatory character ... to explain these aspects of behaviour it is necessary to postulate a non-mechanistic causal principle, which is denoted as 'psychological time'. Behaviour at this level of organisation expresses 'an inherent 'future-

directedness'; past, present and future coexist in every instant' and that animals (and us) '... experience psychological time ... as a feeling of general psychological vitality and meaningfulness. Such an interpretation of subjectivity does not refer to invisible processes of introspection and/or thinking. It refers to the experience of 'relationship with', or 'existence in', one's environment.'

There is, according to ecological psychology, no separation of behaviour / mind / environment / perception; there is only an integrated complex of '... the organism-environment synergy.' (Savelsbergh & van der Kamp 1993 p. 290). These authors talk about '... the inseparability of perception and action.' (ibid. p. 289) and '... the circular causality of perception and action.' (ibid. p. 290). They write that, as Gibson claims, the (in this case visual) environment is an all-about-you

... ambient optic array which animals actively sample, picking up the information needed to guide their action. Action and information (perception) are tight coupled. Information guides the action, and through action new information becomes available to the actor. This is the perception-action cycle. The basic idea is that action-relevant information ... is generated by and used to control and coordinate actions...

According to Gibson (1986), and many researchers and writers since Gibson, the 'information' provided in (most) environments is a practically infinitely variable 'ambient array'. It is only our own activity within this environment which makes it meaningful. We must be proactively inquisitive among the array for it to yield anything to us. Items within the array are not simply there for us to perceive, they are 'affordances' to us - we experience them solely as they 'afford us' something meaningful. All perception is of such 'affordances'. All perceptions of affordances are, at least in part, experienced in terms of actions appropriate to the experience of those affordances under those circumstances.

All behaviour (and learning is a behaviour) is in terms of action appropriate to an individual-environment entity. There is no individual-environment dualism, no behaviour-mind dichotomy. Any such entity involves mind, body, environment and behaviour in a single, integrated whole. It is, though, our behaviour (or potential behaviour as we experience 'affordances') which produces meaning for us as the individual participating in the event. (We cannot, it follows, easily produce meaning, or learning, in an environment offering few or no 'affordances' - 'Janet and John' readers and many drill learning exercises will spring to the mind of literacy teachers.)

This is all very Zen. It is as if there is no spelling and there is no student, there is only the student-spelling event. Without Fred's attention to it there is no spelling and until Fred tries to deal with the spelling there is no student of it. There will only be, if it occurs at all, a spelling-student event. The student must perforce participate in - or be - this event. Without integrated and relevant activity, and in the case of spelling this will include motor activity - writing letter patterns or words, for example - there will be no spelling event and there will be no learning. This observation accords well with more recent work on development in babies and infants (Thelen 1995, Savelsbergh & van der Kamp 1993) and on pain (Wall 1999) which indicates quite unequivocally that our motor systems are involved in everything we do, even in pure perception itself. 'It is apparent that we can sense only those events to which we can make an appropriate motor response.' (Wall 1999 p. 153)

We don't 'know', or even learn, literacy - we do it. The doing is the knowing and the knowing is the doing. It is only 'behaving' (reading, say, or writing) which delivers meaning and it is only meaning which is the purpose of behaving. It is only in the behaving, or at the very least the potential behaving, that we can learn or understand. Without some motor involvement, or at least potential involvement, there is no learning.

Split-brain research and our two brains.

As we have already seen, we have two brains in our heads: the left and the right. The left copes with language and the right could be said to be 'mute', although that may be somewhat overstating the case. Between the two is a thick band of millions of nerve fibres called the corpus callosum. This it is which connects the two hemispheres, which keeps each informed as to what is going on within the other, moment by moment.

Patients with very severe epilepsy were, at one time, treated by surgically cutting the corpus callosum. They are referred to as 'split-brain patients'. The severance of the corpus callosum almost completely isolates the hemispheres from each other - it certainly does so at least as far as higher level activities like 'thought' and 'consciousness' are concerned, although most nerve pathways to and from body, ears and eyes actually cross over at brainstem level. Information at basic perceptual level, therefore, (well below 'thought') crosses over below the corpus callosum and so is not affected by its severance.

Information from (and instructions to) the right side of the body are managed in the left brain and vice versa. Whatever we hear in the right ear is experienced in the left brain and vice versa. The same applies to vision. All fibres from the right side of both retinas

cross to the left brain and all fibres from the left side of both retinas cross to the right (and 'mute') brain - If we stare fixedly ahead, what is to our left is seen only in the right brain and what is to our right is seen only in our left brain, where language is managed. This information passes below the corpus callosum, and reaches those brain areas which deal with it whether your corpus callosum is intact or not. Images, for example, from both sides of both eyes reach those parts of the brain they should, and can be further processed as usual - but if the corpus callosum is cut this interpreted information, this meaning, remains within that hemisphere in which this normally takes place. In other words, if your corpus callosum is intact all this 'higher' cerebral information is instantly shared with the opposite hemisphere, but in split-brain patients it is not. This fact can be used to explore language management.



(Springer & Deutsch 1997)

Imagine a split-brain patient is sitting facing a screen in a darkened room. A dot is projected bang into the middle of the screen and the patient is asked to stare at it. Suddenly, and for less than a second, the picture above is flashed onto the screen, in the exact middle of it so that the patient is looking at a point halfway down and exactly between the two halves of the picture. The picture is not on the screen long enough for the patient to look around within it, so she is stuck with the single image. Her left brain sees the right half of the picture, and thinks it sees a bee; her right brain sees the left half of the picture, and thinks it sees an eye. Asked what she saw, the patient's left brain replies (in language) 'a bee'. Asked to point with her left hand to some pictures, one of which is a bee and one an eye, she points to the eye - her 'mute' brain points to the eye.

If an image is flashed, in like manner, only to the left of the central dot - ie to the right brain only, the 'mute' brain - the patient reports (in language) seeing nothing except a flash of light. If the image had been of an object (say, a spoon) and the patient is then asked to feel with her left hand (controlled by her right brain) among some objects, one of which is a spoon, all hidden from her view by a screen, she produces the spoon. Her right brain knew what had been flashed, even though she could not report it in words. Interestingly, when an image of a naked man is flashed to her left field of view only (to her right brain), in like manner, a lady patient reports that she saw only a flash of light, but then giggles and says 'That's some machine you've got!'. Clearly at some level some information about the image has leaked from right to left brain, even if the patient cannot report it (in language). (Springer & Deutsch 1997 p. 36).

Her own reaction to the saucy picture she cannot report in words is described as 'puzzled' (ibid. p. 39) - as were the researchers.

Chapter two notes.

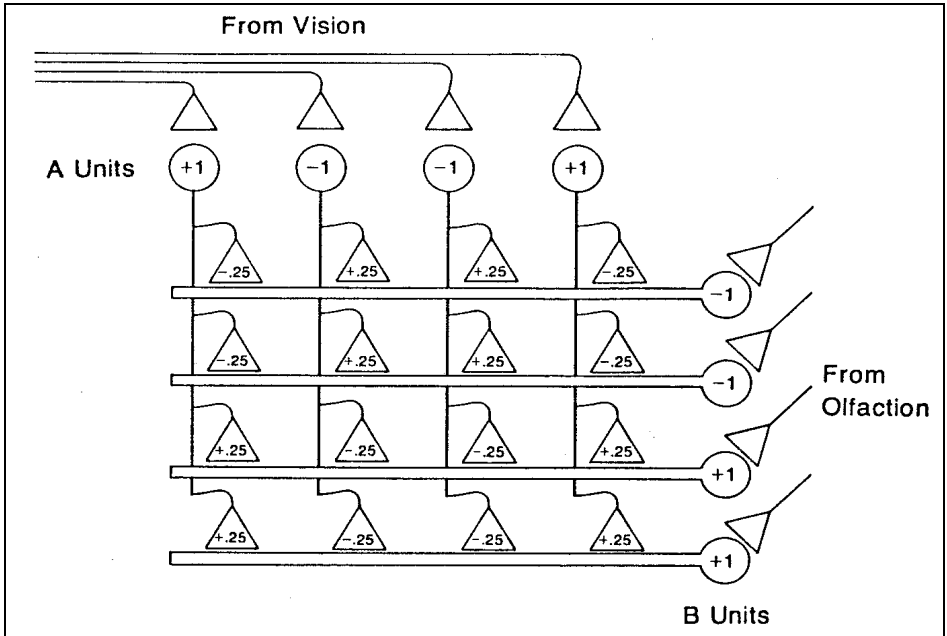
Pattern Associators: Neural nets.

Pattern associators (or neural nets) are a plausible paradigm for learning, memory, recall and association. Pattern associator (or neural) nets, networks of nets and networks of networks of nets (and so on, I suppose) provide a simple and elegant model which is yet robust and economical. It is so in respect of both hardware and software, in computer-speak. It requires little hardware (just a few neurons connected up) and its programmes are simple and easily written; in fact there may be just a single programme (the net's synapses self-setting across the net with values appropriate to their input according to a single rule, the 'Hebb rule' - of which more later).

Biology is always maximally simple, elegant, robust and economical. It is easy to see how what we know the mind actually does can be done using this paradigm; procedures like parallel distributed processing, spreading activation and association fit readily into a neural net theory. Neural nets, as envisaged in the pattern associator paradigm, would be elegant, but they would also be automatic. They would work under their own control, without reference to 'external' control, or rules of any kind. Neural nets would robustly, and absolutely reliably, self-manage, in fact. They would easily learn - adopt and accumulate new and appropriate networks in response to inputs and then deliver new and appropriate behaviours.

Neural nets have been modelled on computer. The models 'behave' in ways very characteristic of us humans. They 'learn' similarly and make the same kind of errors as we do. None of this proves, of course, that we actually do use neural nets in our real brains, but the model is very appealing and credible. It has also indicated some fruitful theoretical approaches to teaching literacy which, in my experience, when adapted for use, have delivered unusually swift and dependable learning in practice. Learning that felt 'natural' to students doing it. I present, in these notes, a simplified version of the account in Rumelhart & McClelland's excellent first volume (1986 pp. 31-40).

You will remember that neurons (nerve cells) in the brain throw out, and receive, thousands of connections (synapses) with other brain cells, near and far away. It is all these interconnections between neurons which is the circuitry itself. You will also remember that these synapses can deliver or receive either positive or negative impulses and that these can vary in strength. Neurons can, in fact, strongly or weakly excite or inhibit each other.



A pattern associator net (Rumelhart & McClelland 1986)

The diagram above shows a simple associator net. It is possibly not much smaller or simpler than a real basic neural net might be. Nice and simple; nice and economic; nice and easy. This is a 4 x 4 cell net, providing 16 synapses. In other words 4 cells are interacting with 4 other cells and they make a total of 16 synaptic connections between each other. Because cell processes can be very short or very long, the cells might actually be close or distant. This would make no difference to the function of the net. We draw the net's components close and in a stylised format for simplicity's sake. The diagram is highly simplified.

In our diagram let us imagine that this net, at this time, is set up to associate information from the visual cortex and from the olfactory cortex. We will imagine the net associates the sight and smell of roses. Four cells from the visual cortex pass the information that a rose has been seen. Four cells from the olfactory cortex pass the information that a rose has been smelled. They act upon the two sets of four relay cells which connect across our little net as shown. The values and directions (+ or -) at relay cell and synapse level were 'set' (according to the 'Hebb rule') when our first roses were seen and smelled simultaneously; so long as these values and directions remain as they

were originally set the net will always, and automatically, associate the one with the other thereafter.

What is the 'Hebb rule'? How might a net learn, right down at this level?

There must be an innate procedure which enables nets to establish themselves (if that's what they do). A likely candidate for how a net might be pre-programmed to programme itself, on demand, (for example when a rose was first seen and smelled simultaneously) is the Hebb Rule. This rule tells circuitry how to set itself such as to associate one input with another. As expressed here it may be just a little too simple, but, in modified form, the Hebb rule may be the only rule your head needs to contain.

When units A and B are simultaneously activated, increase the strength of the connection between them. Adjust the strength of the connection between units A and B in proportion to the product of their simultaneous activation. (A stab at a 'Hebb rule' from Rumelhart & McClelland 1986 p. 36).

I commend the voluptuous simplicity of this paradigm. Our tiny net learned to associate the sight of a rose with the smell of a rose. It did this using nothing more than a simple switch-setting formula, a few synapses and two sets of input applied across these synapses. The association was learned locally, right down at switch level. The wiring organised itself. The neurons themselves, operating to the Hebb rule, or something like it, managed learning without reference to any imposed procedures. (What is learned, of course, depends on what is presented to the two sides of our nets.)

Let us go back to our diagram to examine its function in a little detail. Let us assume that the pattern stimulated upon the 4 'A' relay cells, which maximally indicates 'rose seen', 'reads out' as +1, -1, +1, -1. (Full strength stimulation, two excitatory but two inhibitory.) If the 'readout' at the 4 'B' relay cells which optimally indicates 'rose smelled' is -1, +1, +1, +1, then to achieve this the synapses must be 'set' at the values indicated on the diagram. The relay cells are set to deliver, when they fire, the synaptic values shown. The first 'A' relay cell delivers an inhibitory stimulation at -0.25 on its first and second synapses but an excitatory stimulation at +0.25 on the third and fourth. The second relay cell delivers stimulation to its synapses set exactly opposite, and so on across the 16 synapse net. The synapses are set with a value of 0.25 each, some being excitatory to that value and some inhibitory.

The effect an impulse on an 'A' relay cell will have on its 'B' relay cell (or vice versa) is the sum of the products of its synaptic impulse and its own impulse. The stimulus delivered by each synapse is the product of the relay cell's value and the preset synaptic

value. The stimulus delivered by synapse one on 'A' relay cell one is, for example $1 \times -0.25 = -0.25$. The stimulus delivered by the same cell's fourth synapse is $1 \times 0.25 = 0.25$. The stimulus delivered by synapse one on 'A' relay cell two is $-1 \times 0.25 = -0.25$ and that delivered at that cell's fourth synapse is $-1 \times -0.25 = +0.25$. (In order to understand this last product you have to remember that a negative multiplied by a negative makes a positive - inhibiting an inhibition makes an excitation. Hence the cocktail?) Thus the top row of synapses impinging on the uppermost 'B' relay cell have values of $-0.25, -0.25, -0.25$ & -0.25 which totals -1 . The next 'B' relay cell receives synaptic stimuli to the same tune but the third and fourth receive $0.25, 0.25, 0.25$ & 0.25 , making a total each of $+1$.

The net as shown will, if the 'A' relay cells are stimulated by $+1, -1, -1, +1$ automatically deliver $-1, -1, +1$ & $+1$ where the synaptic values are thus set. 'Rose seen' will deliver 'smell of rose' (or vice versa). The net works just as well in reverse, of course. 'Smelled rose' will deliver 'vision of rose'. And it gets better. The net may, in fact, be used to make more than one association. It may be used to associate more than one pair of items. It might also, for example, associate input from hearing with a memorised 'fact' - I might think 'Beethoven' (among other things) when I heard the Missa Solemnis. When you consider this multifunctionality and the fact that you have millions of neurons each capable of at least a couple of thousand synaptic connections it is easy to see where the mind's colossal capacity comes from. It is also easy to see why behaviourist pair-associative ideas (e.g. stimulus-response bonds & reinforcement) made such sense. And why associative notions still do make sense.

And it gets better still. There is one major and obvious aspect of human mental capacity which the net explains very gracefully. We saw (in chapter two) that our minds may recognise stuff by feature analysis but that, crucially, we do not have to have perfect input in order to make perfect decisions. We do not demand absolute specifications; we routinely get, and routinely accept, approximations. We think fuzzy and can manage fuzzy. Indeed, as we saw, the ability to use a degree of approximation is just about essential. We can, and regularly do, accept thoroughly imprecise data (as with the dog) and process it through to perfectly precise (and almost always correct) conclusions.

Pattern associator nets elegantly process imperfect inputs and reach perfect conclusions from them. To go back to our specific little net; if we saw a rose, but it was not a good example (if it was a 'degraded stimulus') - most of its petals gone and laying, somewhat squashed, on the floor - the input on the 'A' relay cells might degrade to only half their value (0.5 instead of 1) but would retain their direction ($+$ or $-$). Passed across the net these values would deliver exactly half the stimulus strength onto the 'B' relay cells but, again, in the same direction ($+$ or $-$). This output, particularly as still in the

correct directional pattern, will be adequate to stimulate the relevant olfactory cortex and induce 'smell of rose'. Faced with a very weedy 'rose seen' we still managed 'smell of rose' perfectly. Even if one 'A' relay cell were to be knocked out, to cease function, the net will still deliver a pattern across its remaining synapses perfectly adequate to stimulate association. In the words of Rumelhart & McClelland (1986 p. 36) the '...pattern retrieval performance of the model degrades gracefully both under degraded input and under damage.'

How does such a model 'behave'? A computer simulation has been built to the specifications of a network of nets which build themselves up as information comes in. Each net associates one pair of bits of information, and the 'synaptic' connections set themselves according to an inbuilt Hebb-type rule. The simulation has been given various things to learn and has then been tested on its knowledge. Among these tests has been the formation of past tense of English verbs (no 'rule' about tense forming, just a lot of examples of past tense forms). After a number had been learned new 'irregular' verbs were presented (eg 'purd' & 'gimp'). The program postulated regular past tense endings ('purred' & 'gimped' for example). The machine also 'over-regularised' some already learned irregular verbs, producing 'camed' and 'wented' just like children do. The machine behaved in an apparently rule-mediated way although it knew not a one.

The model learns to behave in accordance with the rule, not by explicitly noting that most words take -ed in the past tense and storing this rule away explicitly, but simply by building up a set of connections in a pattern associator through a long series of simple learning experiences. The same mechanisms of parallel distributed processing and connection modification ... serve, in this case, to produce implicit knowledge tantamount to a linguistic rule. The model also provides a fairly detailed account of a number of the specific aspects of the error patterns children made in learning the rule. In this sense it provides a richer and more detailed description of the acquisition process than any that falls naturally from the assumption that the child is building up a repertoire of explicit but inaccessible rules.

(Rumelhart & McClelland 1986 p. 36)

I have begun to wrestle with chaos theory. This, it seems to me, might make for an excellent theoretical understanding of how mind might actually organise – how a few simple 'instructions' or innate procedures, something like continuous iteration, might result in the complexity of mind. Certainly biology contains endless examples of complex things – structures or procedures. Equally certain is it that when we do understand them we see that they are made up from much simpler basic procedures or

structures which, when repeated in large enough numbers, form a complexity so labyrinthine as to have been apparently beyond explanation.

Our brains are 'hardwired' at birth with some already installed behaviours (e.g. suckling, breathing) and some drives (e.g. socialisation, our intense desire to learn). We learn, though, the overwhelming majority of that which we know and which our brains need to know but do not see the need to tell 'us' about (e.g. how to manage language & literacy, how to walk and chew gum). Most of our brain at birth is undeveloped, waiting to develop and fill itself with stuff - what stuff depends on what we come across. Most of our brain is generally associative; available for learning full stop. What is to be learned is not specified. We probably therefore (it would be most elegant and economical) learn everything using the same fundamental neural procedures (nets and a 'Hebb rule' of some kind for example). There must be an innate overall 'program' or 'neurological behaviour' which enables it all. Is this a chaotic formula? I ask the question, but I most assuredly do not answer it. I leave that to you. Here are some references to help you. 'Pop' science paperbacks include Cohen & Stewart 1995, Gleik 1987 & Stewart 1997. Then try Abraham & Gilgen 1995, also in paperback, but not really 'pop'. Enjoy.

Chapter three notes.

On experimental exploration of the mental lexicons.

These notes will, I hope, go some way to dissipating any lingering distrust of, or distaste for, cognitive psychology. These notes describe some of the more classic and historic priming experiments, and some experiments using techniques similar to priming. I hope they will entertain. I hope you will feel able to say after reading these notes; truly, cognitive psychology does reach the parts other disciplines cannot reach.

As we have already hinted, priming (and similar techniques) have given us much of the most basic information we have as to how reading may actually be done inside our inscrutable unconscious. Enabled us to speculate more accurately about the workings within our 'black box' minds. Radical critiques of experiments such as we are about to explore have claimed that their techniques are irredeemably artificial and reductionist, focussing, as they usually do, on the reading or manipulation of single words outside of any meaningful context. Such rarified and abstracted circumstances, it has been said, cannot model such a complex behaviour as reading meaningful text. Considerable similar work, though, has been done with whole sentences precisely to explore whether this is likely to be true or not (this work is wonderfully described in Taft 1991). As a result, Taft has concluded that:

'Lexical access does not appear to be fundamentally different when a word is contained in a sentence compared to when it is presented in isolation' and that '... decoding mechanisms involved in accessing words in context are essentially the same as those involved in accessing isolated words...'
(Taft 1991 p. 57).

Thus emboldened we will examine some historic experiments and the conclusions drawn from them. Examples are mainly taken from Ellis 1984, Rayner & Pollatsek 1989, Taft 1991 & Underwood & Batt 1986.

To get us into the mood we start with the entertaining '*Stroop effect*'. This is not a priming experiment as such, in that only 'targets' are presented. The long-suffering subject is asked to make a decision about a string of targets without first seeing a prime stimulus. Otherwise the technique is much the same, in that the time subjects take to make their decisions, and the accuracy of their responses, is measured. In one Stroop experiment subjects were asked to report only the colour of the target (which might be a word or a letter string or a drawing) and to ignore everything else. They might be told

to indicate whether the target was yellow, blue, green or red, for example, as fast as they could. Among the targets would be the name of one colour, written in another – for example subjects might see the word RED, but written in green at some point. They are supposed to ignore the word and report the colour in which the target is written, so should report GREEN. They mostly do this correctly, but it takes them significantly longer and the error rate is increased.

In another Stroop experiment subjects were shown line drawings and asked verbally to report what each drawing represented. Among the target drawings were some which contained words; thus the subject might see a drawing of a dog with the word CAT written inside it, or a boat with the word HOUSE within it. In these circumstances subjects generally report the identity of the drawing correctly, but again it takes significantly longer and more errors are made.

This is interpreted as indicating that we automatically, and always, process words we see clearly. We do this, in fact, even when we have been specifically instructed not to – to attend exclusively to another property of the target altogether, such as its colour or what it represents, and to ignore all other information on the screen. We can probably say, as a result of these findings, that, in the psycho-jargon, word processing is *mandatory*; it is an involuntary thing all fluent readers do unconsciously whether they will or no. Under the conditions of the Stroop experiments the processing of the words seen meant that, in effect, two pieces of information (RED *and* GREEN, or CAT *and* DOG) were arriving simultaneously. Subjects were momentarily confused, and it took them an extra couple of hundred milliseconds to sort out which item was to be reported. The important conclusion was that both items were automatically processed, despite subjects trying not to do so.

Priming experiments have demonstrated the powerful, and automatic, mandatory, nature of *spreading activation*. Subjects are shown prime/target pairs. The prime appears on the screen momentarily, then disappears to be followed very shortly by the target stimulus. The subject must make a decision about the target.

Targets, in this instance, are either non-words, unrelated real words or related words. A prime, for example, might be HAMMER and the associated target either CAILS, SAILS or NAILS, or the prime might be DOCTOR and the target either DURSE, PURSE or NURSE. Subjects have, as usual, to make a *lexical decision* and in this case to indicate, as fast as they can, whether the target is a real word or not. In this instance, if the prime was DOCTOR and the target NURSE, or the prime was HAMMER and the target NAILS they will make their decision significantly faster than in either of the other two options in each pair test. This is taken to indicate that sight of the word DOCTOR, for example,

excited all related items so that NURSE was already somewhat activated even before it was seen, making its recognition easier, or at least faster, compared, for example, to PURSE, which was not activated by DOCTOR.

Priming has also been used to demonstrate that we hold 'free' and 'bound' morphemes separately, as whole items, in our semantic lexicons. A free morpheme may be a word – for example walk, free, pain, do, pay, quick. (A bound morpheme is a morpheme which must be bound to a free morpheme to make sense, for example, -ed, -dom, -ful, un-, -ment, -ly.)

An experimental technique to investigate the management of bound and free morphemes might go like this: Subjects see primes which are free morphemes and targets which may be these words with bound morphemes attached to them, or unrelated words, or non-words. As so often, subjects must decide whether targets are real words or not. A prime might be PAIN, for example, and targets either PAINLESS, PAINT or TPINA, or a prime might be SICK and target either SICKLY, SICKLE or SELCKI. Subjects, it is found, are faster when identifying the root + affix (eg PAIN - - - PAINLESS or SICK - - - SICKLY) than the real but unrelated word alternative target if that is shown (eg PAIN - - - PAINT or SICK - - - SICKLE). Similarly, CAR will prime CARS but not CARD; SEE will prime SEEN but not SEED. This is in spite of their orthographic and phonological similarities. In other words we are not 'primed' by previous sight of a similar letter string but we are significantly primed by sight of a morpheme – by meaning - (PAIN as in PAINLESS but not as in PAINT; CAR as in CARS but not as in CARD). (e.g. Murrell & Morton 1974)

The phenomenon of 'floating morphemes' confirms the conclusion that we hold morphemes as such within our mental lexicon and only *concatenate*, or unite, them in the *post-lexical* assembly phase of constructing language. In other words we find the relevant roots and bound morphemes separately in the lexicon, fetch them out, as tiny meanings, separately and put them together appropriately outside the lexicon. We don't, in other words, store compounded words like, for example, 'meaningful' or 'meaningless' in our lexicons – we store 'meaning', '-ful' and '-less' separately and put them together as necessary en route to saying (or writing) the whole word.

Sometimes we don't quite get this right and may say things like: 'a plumful of hats' [a hatful of plums] 'he was cooked spotting dick' [he was cooking spotted dick] or 'she writes her slanting' [she slants her writing]. (I once announced to a roomful of goat breeders 'The winner numbing is ...'.) We do not usually transpose random bits of words, but whole morphemes. We do not tend to do things like 'he was cooted spocking dick'.

The question of whether reading is visually or phonically managed has been extensively researched by priming methods, as we have already glimpsed (& see Taft 1991). Morton (1979) used priming to explore the independence from each other of possible auditory and visual access systems to the semantic system (and see appendix 1) as follows: Subjects heard some prime words spoken but read others from the screen before them. They also heard some target words spoken but read others on the screen. Some targets were real words unrelated to the prime words and some were non-words, but some target words (the ones the experimenter was really interested in) were exactly the same as the prime. Subjects had to indicate whether they thought targets were real words or not.

Morton found that when prime and target were identical and either *both* auditorily presented or *both* visually presented reaction time was less than when auditory prime presentation was followed by visual target presentation or vice versa. In other words subjects were 'primed' when identical prime and target were both spoken, or both read, but not primed when one was spoken but the other written or vice versa. Morton concluded that there must be separate and independent visual and auditory systems accessing the semantic system. Priming experimentation enabled him to infer that the black box contains visual pathways from text to meaning, and phonological pathways from sound to meaning, and that these pathways are distinct and, at least in 'pure' circumstances, function completely separately.

Gipson (cited in Ellis 1984 p. 31) found that priming with visually presented and conventionally spelled words (eg. FOX, YACHT, COME, BLOOD) did not prime their recognition if the same words were then presented as spoken targets but that if the prime words were visually presented but spelled phonetically (eg PHOCKS, YOTT, CUM, BLUD) then subsequent auditory presentation was primed. Time taken to process the spoken word 'FOX' or 'BLOOD' was shorter when PHOCKS or BLUD had just been seen than when FOX or BLOOD had (and the target word was presented verbally, as a spoken stimulus). Gipson concluded that the reader in case one was not activating (or perhaps not strongly activating) an entry in the auditory lexicon (because he was reading to meaning purely visually) but that in case two the reader was activating phonological lexical entries (through grapheme/phoneme conversion) in order to reach meaning.

In other words his subjects, under normal circumstances, were reading visually and only called phonics into play when visual reading failed. Normal reading did not require phonological analysis.

Purely orthographic structures (visual letter patterns, as opposed to their sound-correspondences) strongly affect our perceptions of words and non-words. We are visually highly sensitive to the likelihood, or 'legality' of letter strings. The commoner the letter string, the more powerfully it is excited when we see it. We take longer to decide that a non-word is a non-word if it contains a 'legal' letter pattern than if it does not - if its letter patterns are 'illegal'. We have more trouble deciding to reject FLUNCH, or BLANTICK than we do HCLNUF or KLBNAICIT, for example. We have no difficulty rapidly and accurately seeing that the last two are utterly 'illegal'. The more common, and so plausible, the patterns in a non-word are, the more difficult it is swiftly to reject it. BLONG, for example, contains two highly legal strings, one very common indeed, and will take longer to reject than BLIOM in which one string is very uncommon (iom as in idiom). (e.g. Rubenstein *et al* 1970)

Very similarly, it has been shown that a letter string in a non-word which is very like a letter string in real words makes the non-word more difficult to reject. For example, we take longer to reject TRIAN (which is close to TRAIN) than we do TRUAN (which is close to nothing much). (O'Connor & Forster 1981.) Furthermore some words have a considerable 'neighbourhood size effect' as many, and many common, words are close 'neighbours' (orthographically speaking). (Coltheart *et al* 1977.) For example JATE will take more time to reject because it is similar to so many, and such common, words (JADE, GATE, LATE, HATE, RATE, DATE, FATE, MATE, TATE etc) whereas RALD is more easily rejected as its 'neighbourhood' is sparse and uncommon (only RASP & RAMP, perhaps RAND).

The pronunciation of written language, the sounds corresponding to the letters and letter patterns, does appear to have an effect on reading. It still remains unclear precisely how much effect this phonological processing exerts, at what point it exerts it, and how it does this. Some priming experiments have investigated this.

For example Rubenstein *et al* (1971) demonstrated the *pseudohomophone effect*. They showed that it takes longer to reject a non-word if it is homophonic with a real word (if it makes the same sound). If some of the targets in an experiment are non-words deliberately chosen to sound like common real words (*pseudohomophones*) their rejection will take longer. If, for example, non-word targets included SPUNE, KREME or PHICKS then extra time would be taken deciding they are not real words compared to the time taken to make the same decision when the non-word does not sound like a real word. Clearly, letter strings were processed, phonologically, and reached meaning by this route. This secondary processing obviously interfered with the direct, visual reading, and then dismissal, of the non-word. When and how, exactly, did this interference occur, however? We know that, with real and easily recognised words we

read entirely visually. Have we done this with, for example, KREME or PHICKS, finding no matching entry in the visual lexicon, only to have the 'useful second pass' of phonological reading arrive with the news that there is an entry in its lexicon which appears to match, and having therefore to do a re-check?

The *pseudomember effect* shows that the sounds of letter strings do affect reading to meaning. Suppose subjects are asked to make a simple yes/no decision on target words – eg are they members of a particular group (eg foods, or fruits) or not? The prime might, for example, say FOOD? or FRUIT? and the question is whether the upcoming target word is a member of that group or not. Some prime/target pairs and target words are unremarkable (eg FOOD? --- BREAD calls for a yes, FRUIT? --- APPLE likewise), but some targets are homophones of affirmative answers (eg FRUIT? --- PAIR or FOOD? --- MEET). These two are *pseudomembers* of the group. You will have guessed by now that subjects are consistently slower, and less accurate, when faced with homophonic non-members (pseudomembers) than with similarly spelled but non-homophonic non-members (eg FOOD? --- MELT, or FRUIT? --- GROPE). Once again it is clear that the phonological representation of these letter strings has been made, and taken through to meaning, automatically. The pronunciation of the letter string has clearly interfered with our rejection of it as a non-member of a group but it is not obvious how, or at what point in the chain, this interference happens. (Van Orden 1987)

The *interactive-activation, or distributed processing* model is one possible explanation for these interesting findings implicating phonological processing in reading even simple, common words well within the reach of the kinds of subjects usually used in this kind of experimentation. This model invokes the idea of the brain as a massively parallel processor, routinely managing different aspects of the same issue simultaneously. (We have already seen that our brains probably do indeed work in this *parallel distributed* way.) The model accepts that direct, visual reading is the cheapest, simplest and fastest route and will be the way most reading is done by fluent readers under most circumstances. However, the model proposes simultaneous, or almost simultaneous, processing around the phonological pathways, through the phonological lexicon (probably through mandatory *spreading activation*). This route is much less simple, and so its findings may arrive too late to play much part in normal reading, but arrive they probably do nonetheless, such that they may be useful as a secondary way to achieve a difficult reading (or to interfere with lexical decisions during a priming experiment!).

And it is still debateable how strongly the phonology of target items is affecting the decisions made about them – how strongly does the pronunciation of letter strings reverberate through to affect semantic word recognition? Is there an orthographic effect? There are experimental findings which contradict, or at least considerably dilute,

the suggested effect of phonology on word recognition. These experiments seem to indicate that, even in experimental circumstances where the pseudohomophone or pseudomember effects are apparently unequivocally shown, the effect of the orthography of targets may be being seriously underestimated. The orthography, the spelling, the purely visual appearance of letter patterns and strings, may be as important as the apparently pronunciation-mediated effect appears to be.

For example, Taft found that the pseudohomophone effect was greater to pseudohomophones spelled with similar letter patterns to the mentally associated real word than to those spelled with very different letter patterns.

... while homophone decisions to SKREAM are indeed faster than those to SKREME, homophone decisions to SKEAM are slower than those to SKEME. What influences response times is the fact that SKREAM is orthographically more similar to SCREAM than is SKREME, and that SKEME is orthographically more similar to SCHEME than is SKEAM.
(Taft 1991 p. 65.)

In other words letter patterns had considerable non-phonological input to this reading. If researchers find it difficult precisely to resolve the role of phonology in word recognition, far be it from me ... Perhaps a wiser man would leave it at that. However, one further experiment, exploring reading to meaning (as opposed to simple word recognition) under conditions of *articulatory suppression*, is interesting and relevant in this context.

Articulatory suppression: Researchers sometimes ask subjects to perform certain tasks while their phonological system is simultaneously fully occupied in quite another task. Subjects may, for example, as in this instance, be asked to carry out decision-making tasks on items presented on a screen as usual, but to recite something unrelated (for example the numbers from one to ten) continuously while doing so. In this way researchers hope to cancel the phonological system by flooding it with input unrelated to the stimuli they wish to manipulate, thereby to gain some idea of the role of phonological processing in whatever aspect of cognition they are exploring.

The experiment I am about to describe involved subjects reading sentences from the screen and making the yes / no decision as to whether they made sense or not (eg NOISY PARTIES DISTURB SLEEPING NEIGHBOURS makes sense whereas PIZZAS HAVE BEEN EATING JERRY does not). While doing this, one sentence after another, some of the subjects also repeatedly recited a distractor stimulus aloud (for example the numbers one to ten over and over again). These subjects were doing the decision-

making under conditions of articulatory suppression, with their phonological processing system continuously filled with nonsense and therefore presumed to be unavailable for working on the decision-making tasks. (Kleinman 1975 reported in Taft 1991 pp. 72-73.)

The subjects who operated under articulatory suppression, in the event, made their decisions much slower and made many more errors than those who made their decisions without simultaneously reciting. In other words reciting unrelated stuff aloud renders the making of sense from text more difficult. This would accord with Adams' conclusions as to the probable role of 'the phonological processor' in reading whole sentences under normal conditions. She regards this role as chiefly to enhance our memory for recent words – holding onto what has gone before in a sentence for long enough to correlate it with what is to come later and so, eventually, being able to make sense of the whole thing. 'Skilled readers can neither remember nor comprehend a complex sentence when they are prevented from subvocalising its wording.' (Adams 1990 p. 188) (On the other hand, asked to recite the Lord's Prayer over and over, or even just repeatedly count to ten, would make me much less effective at any task, including DIY, probably, so what it would prove I hesitate to claim with any confidence.)

Chapter four notes.

Frank Smith says, simply: 'Children cannot be taught to read.' (1985 p. 5). At first sight this seems a depressing and pessimistic surrender, but is written at the start of a positive account of how children, if we let them and provide just a little of the right pedagogy, learn to read easily and painlessly. Smith says, and I believe him, that reading is not difficult to learn. By page 94 of the same book he is writing: 'we learn to read by reading.'

'The teacher's problem is never the lack of advice.' (ibid. p. 3.) There is a plethora of practical, now-do-this advice. I want to add very little. My desire is to make a better join between the hall carpet of practice and the kitchen tiles of theory; to have a look around in the kitchen while yet remaining out in the hall. We are simply trying to match carpet as closely as possible to tiles.

Paired reading (especially for use with adult students):

Also called shared, apprenticeship or scaffolded reading. It is supported 'real reading'; a way to get students reading at reasonable speed, accurately and in some volume. Learning to read is like learning to ride a bike, to walk, to swim or to talk - you do it by doing it. There are methods and there are better methods but there is no short cut - we learn to read by reading. Students have to read, and they have to read as much as possible. The question is how to enable students to approach reading with confidence, to do more, to do it fast enough and to read for meaning and enjoyment.

In the earlier stages of learning to read, paired reading is brilliant method - both technically and affectively. (Campbell 1990, Coles 1992, Martin 1989, Topping 1992, Waterland 1985, Yule 1999.) It works particularly well with the student who hasn't reached independent reading at the technical level or who is still so intimidated by reading that he won't do it independently (and see Martin 1989 p. 53). These students typically spend time fighting single words ('barking at print') and so lose meaning, confidence and peace of mind altogether, or they simply read too slowly to reach meaning. (Below about 120 words a minute meaning begins to slip away.)

Adults may, initially, find paired reading a little humiliating but must be encouraged to lie back on support and enjoy. This is astonishingly hard for some - as if it is evidence of general worthlessness, or 'cheating'. It's exactly like learning to ride a bike, though. We all need support when learning to ride a bike. It is not always easy to accept support,

however; I remember, when learning to ride my new bike, how much I resented my father holding that saddle, but also how quickly I learned and how soon he let go of it.

Student and co-reader should agree a text to be read. Something within range, but enjoyable and meaningful to the student. Make sure he knows what the text is about (is it a short story, a news item or the manual for a MIG welder?). In the very earliest stages it may be useful to read it aloud once to the student before co-reading begins. Get comfortable, where both can easily see a copy of the text. Start reading, aloud together, and bang on. The student should really be reading, the co-reader supporting, so ideally the tutor is a microsecond behind the student. The student reads in the knowledge that help is only that microsecond away. If a word is not read, or is read incorrectly, the tutor immediately provides it and on goes the reading, as long as meaning is still being successfully extracted. If the sense is being lost, retrace steps, perhaps to the beginning of the sentence, perhaps the paragraph.

The pace should be reasonably fast and the reading clear and with all those meaning-making emphases, rhythms and modulations. If the student is doing well, and is full of confidence, the co-reader may be asked to shut up, or simply decide to fall silent, and the student continues alone. If real faltering happens the co-reader can always come back to support reading. If serious faltering repeatedly happens, stop. The material is too advanced, or the student too tired, or something. Do not flog this technique. If the emotional temperature rises, stop. Do something else. Never leave a student to bark at print. Never compound failure.

It is surprising what text is simple and what is not. Newspapers use a mutually agreed code language with quite difficult vocabulary at times. Specially written material can be dire. (One researcher, for an example, found a children's 'easy reader', incredibly, made as much sense read back to front as any other way.) As Martin says, of remedial reading material, the '... language had been so pared down and simplified ... that only the words remained.' (1989 p. 56).

Read-along (also especially for use with adult students):

I am big on homework (for adults; please, please, not for children!) as I feel it is difficult to learn much if you only have one two hour class a week, as is the case in much of ABE. Most adult students agree wholeheartedly, once they get the literacy bit between the teeth. Such students, mindful of the Matthew effect and seeking volume of reading *per se*, and having found paired reading helpful, have asked for recorded readings to read along with at home. I call this read-along. I could have called it 'the workaholic's scaffolded reading tool', or 'paired reading for the fireside'. The objective of the

technique is simple - it is to increase the quantity students read, painlessly. Almost every student trying read-along at home has asked for more.

The student gets a recording of a reading, and the text. He listens to the recording while reading the text. This means the text must not be edited or abridged in any way, and this means that you will have to produce it yourself. I record onto computer. This makes recordings easy to store and repeat copies can be made . I have recorded short stories, jokes and off-beat news cuttings (usually translated into more everyday language) as well as the manual for a MIG welder. Stories are ideal for the more fluent reader simply to practice reading in volume and at reasonable speed. Jokes and news items are shorter and can be rendered into short sentences and simple language, so can be used for the less advanced reader.

Students give very positive feedback and are motivated. They always complete the reading and then demand more. They seem to enjoy their reading. Read-along seems to improve confidence and the technique demonstrably belongs to the student. Comprehension is usually very good, so presumably students are formulating schemata, prioritising ideas, questioning, making appropriate inferences and connections and experiencing appropriate imagery, as texts on comprehension demand (and see the excellent Keene & Zimmermann 1997). I think it is very important that we not 'test' students on their reading, and I do not. The reading should be absolutely pressure-free, done for uncomplicated enjoyment; done exactly as we read in fact.

Word recognition skills – Dolch list & flash techniques (especially for the early stage, adult learner):

Reading is much, much more, of course, than simply recognising words one after the other. They must, though, be recognised if we are to read at all. It is, as we have seen, probable that many words are recognised as whole words, with larger, composite words being recognised perhaps in letter groupings – perhaps roots and morphemes. It is certain that fluent readers do not read letter by letter, and neither should students.

Some words are so simple, and so common, that it seems to me they may usefully be learned as wholes. I am talking about the first hundred 'keywords', the Dolch list (and see Beard 1987 p. 77 and the adult literacy core curriculum, Basic Skills Agency 2001 pp. 59 & 67). These words are astonishingly common. They are also very often the meaning carriers, with other words around them highly predictable from context.

One in every five words you read will be one of the following: *in, was, is, I, he, it, a, the, that, to, and, of.*

Fully half the words you read will be one of the above or the following: *are, for, you, had, so, have, said, as, not they, with, one, we on, his, at, him, all, but, old, be, up, do, can, me, came, my, new, get, she, here, has, her, will, an, no, or, now, did, by, if, go, down, just, out, your, into, our, went, them, well, there, were, big, call, back, been, come, from, only, first, off, over, must, make, more, made, much, look, little, some, like, right, then, their, when, this, two, see, about, could, before, other, which, what, where, who, want.*

In case you find these statistics hard to credit, read the following passage in which the first twelve keywords have been italicised and underlined, the remainder of the first 100 keywords being simply underlined.

If you have ever been on an underground train in London you will have seen the pipes that hang from the walls of the tunnels. I believe that one of these pipes is a curry pipe. I think that there is an enormous boiler in the middle of London which makes curry twenty four hours a day and that this curry is then pumped out along the curry pipes in the tunnels of the underground system to restaurants all over town. This is the only explanation I can offer for the fact that curry looks, and tastes, exactly the same all over London but is hotter in the centre of town than it is in the suburbs.

In this passage (which I wrote in the 1980s – things are different now!) there are 117 words all told of which 40 (34%) come from the first twelve keyword list and 71 (61%) from the list of the first hundred.

For a beginner reader, without real facility in instant reading of these words, I believe their ubiquity justifies the resurrection of a ‘flash’, or ‘look and say’ method. First, their ubiquity should be demonstrated in a short piece of text to the student’s satisfaction if the student finds it hard to believe (as I did). Each keyword is then written, in large clear felt tip, on one side of a card. On the other the word is written in small script. The cards are ‘flashed’ for the student to read, the tutor able to see, from the rear of the card, what the student can see on the front of the card. The exercise is presented to the student as a visually mediated attack skill. The objective, which the student needs to be meta-cognitively clear about, is to be able to recognise instantly, and by sight, each keyword as a whole item.

To bring this into the 21st century the exercise is easily managed in Powerpoint - I write each word (in large comic sans) on two slides with a blank between and reveal thus: word - blank - word - blank - new word - blank - new word - blank ... This makes it possible to flash the word then show a blank screen while it is ‘read’ then show it again

so as to make sure everyone is content. It is also possible, of course, for students to do this for themselves at home. For a readymade PowerPoint presentation of frequent words exactly as described visit:

<https://www.hugokerr.info/hugo/teaching-resources/>

Imaging skills and real world flash (especially for use with adult students):

Sometimes, while trying to do one thing you find you have done another, and apparently different but much better, thing.

Another apparently 'flash' sight reading method I have used with early to intermediate adult students involves showing colour slides of social sight vocabulary. The technique was originally intended as a light-hearted way of differently approaching one particular kind of reading practice, namely the rapid reading of important information from signs photographed in situ in the real world. I have come to the conclusion it may be doing much more than that; that it may be teaching more powerful and more general skills. I believe it is analogous to the 'listening skills' technique, which tightens up the ear (and see notes to chapter 5). This technique 'tightens up' our looking in exactly analogous ways. The skill of better looking seems to generalise, in the same way that better listening does after practising listening skills. All real world vocabulary, all signs, seem to become more visible, or perhaps just less threatening.

This technique seems to induce improvement in mental imagery (and see Center *et al* 1999). It also improves confidence. How does it work?

First let me make clear what I mean by 'social sight' vocabulary. This is simply words seen in the real world which have relevance. Signs like *toilets, gents, ladies, staff only, no entry, pull, push, way out, pay and display, departures, arrivals, car park, no smoking, keep clear, private, no unauthorised personnel beyond this point, open, closed, emergency exit, sale, out of order, car park for patrons at rear, steep hill engage low gear* and so on and so on. Over the years I have accumulated many images of such signs. (My favourite reads *open 7 days a week except Tuesdays.*) This is how I use them.

I run a short show of perhaps fifty vocabulary slides interspersed with blank slides. I call up a slide of, for example, a sign reading 'no admittance' and leave it up for a very short time, probably well under a second, (depending on the level of the student). Then I replace it with a blank slide so that the screen empties. At this point either the student has either already read the sign, in which case we can go straight on to the next slide, or he is stuck with having to hold the image in his mind and 'read' it there. This empty

screen period is the really productive time, I believe.

If there is not fairly swift success, then the original slide is shown again and the sign read from it. My experience has been that the rate of success, and speed of achieving it, increase rapidly through a single session and that confidence swiftly grows. Having to 'see' signs in the mind's eye seems to help literacy imaging skills generally – in other contexts. It's training the mind, I think, in an approach, an attitude, a belief. (It's also fun and that's not such a bad thing.)

A relevant selection of images of increasing complexity for any particular occasion can be assembled, for example, on PowerPoint, with blank screens interspersed between them. Moving forward and backward through the images is simple. The reason for the technique (visual word recognition skill training) and its procedures must, of course, be very fully explained to the student.

A large collection of real world sign images is available at:

<https://www.hugokerr.info/hugo/teaching-resources/>

Reading speed:

The analogy with learning to ride a bike still works. Below a certain speed the thing collapses painfully into a meaningless and humiliating jumble. Thus it is with reading. Below a particular speed reading becomes too ponderous for comprehension. Smith (1994 p. 80) suggests that this minimum speed is about two hundred words a minute. My own experience (with read-along) leads me to suggest a lower figure of about a hundred and fifty words per minute. When reading (paired reading or read-along) with intermediate level students this low speed is probably necessary if he is to keep up in his text, as he must. Students report that reading still works at this speed. Additional evidence is that some of my recorded stories were sent out as part of the local school's weekly 'talking newspaper' without any complaint about their ponderous pace.

Students need to understand that they absolutely must read in quantity if they are to push back on the Matthew effect; they must appreciate that reading has to be done above a certain speed if it is to be understood. This brings me on to:

Signal detection theory:

A matter of criterion and confidence. This fascinating insight is taken from Frank Smith (1994 pp. 59-60). Signal detection theory comes from observation of the behaviour of operators in the defensive radar systems round Britain during the second world war. It turned the received wisdom of the day on its head in respect of our perception of the world.

It had, reasonably enough, been thought that we either see something, in full, or we don't. There is no choice whether to see something or not, or how much to see of what. If it's there, we'll see it, if it's not we won't. Life, of course, is not always that simple. In situations which are not absolutely clearly defined the observer's own attitude may influence what is seen. Not only that but the proportion of correct perceptions can be chosen by the observer. Choosing a high level of accuracy, though, will increase the error rate. 'The more often you want to be right, the more often you must tolerate being wrong.' (ibid. p. 59). Signal theory works like this:

Radar operators were employed to spot incoming enemy planes so that they might be attacked and destroyed. They saw considerable 'noise', in those early days of radar, on their screens. It could be difficult to detect the difference between genuine 'blips' which heralded the arrival of a plane and this spotting 'noise' on the screen. The operator has two choices – target or noise? He (or she) could make two correct decisions and two wrong decisions. Correct decisions would be calling a genuine 'blip' a target, or correctly deciding screen noise was just noise. Wrong decisions would be false alarms or misses. A false alarm would be calling screen noise a blip, (scrambling defences for nothing) whereas a 'miss' would be calling a blip noise (letting a target through unchallenged).

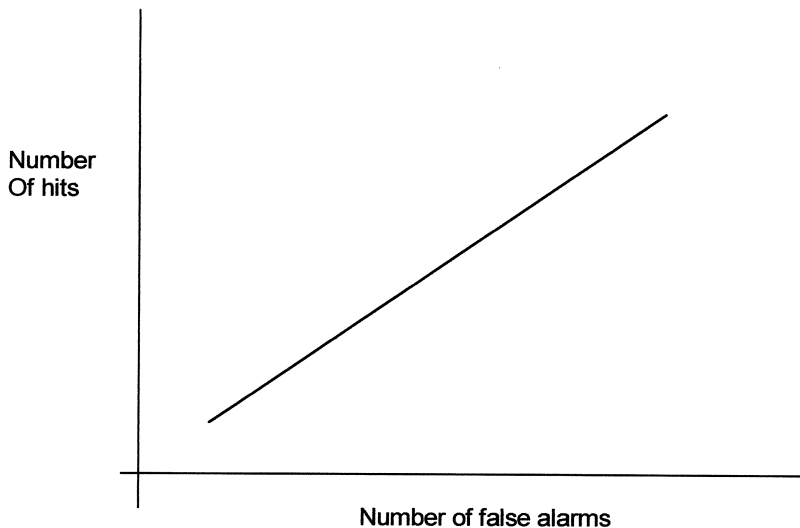
The operator is not always working against exactly the same environmental background and so will not always apply the same criteria to his decision making. If he knows there is plenty of defensive firepower available, for example, he may decide to be extra sure to spot every incoming plane, to reduce the number of misses. He will opt for challenging anything remotely like a blip under these circumstances. The hit rate will rise but so will the false alarm rate.

If there is a scarcity of available defensive firepower the operator may use a different criterion. He may decide to conserve firepower by only challenging when he is absolutely sure a blip is a real blip, not screen noise. His false alarm rate will fall but so will his hit rate.

Whatever he does, that particular operator with his own particular level of skill, cannot improve on his hit rate without increasing his expensive false alarm rate and he cannot decrease the number of false alarms he sets in motion without increasing the number of attackers he lets through.

The point is that the decision as to what to see is made based in considerable part on criteria set by the operator. This is a cost-benefit decision. To obtain more of one desirable means an automatic decrease in another. For any operator using a particular machine the rates are all inextricably bound up together. A good hit rate entails a high false alarm and low miss rate, and vice versa. These relationships are inevitable. (The only way this mandatory association could be changed is if the operator became better skilled or the RAF gave him a better radar machine.)

I have drawn this relationship between hits and false alarms as a 'receiver operating characteristic curve' (you know how mathematicians talk). The operator can only move up and down on his curve. He cannot alter this relationship without improving his own skills or getting better equipment. Thus it may also be with reading. No reader can other than move up or down his own curve. If his hit rate (the number of correctly read words) is to rise, then he must accept a rise in the number of false alarms (or incorrectly read words).



Receiver operating characteristic curve

It is, in other words, important that the right reading accuracy criterion be chosen, and deliberately so.

If, through anxiety or as a result of instructions, a student believes it is crucial that every last word be correctly read (that that is what reading is) then the number of wrongly read words will fall – but so will the number of correctly read ones managed within a reasonable time. This may paralyse his reading. If confidence grows and the student decides to allow for a certain number of wrongly read words then the hit rate will also rise.

The hit rate has to be kept high, so it is also, by definition, necessary deliberately to accept that there may be some wrongly read words. The only way this can be improved is by improving the student's own reading skills or by choosing a different text to read. (The choice of text is, of course, of major importance.) Tutors must avoid, though, inculcating a rigid, anxious insistence on reading every word correctly at all costs; must avoid giving the impression that that decoding is what reading is. A student must be kept high on his graph by keeping confidence high. Weak readers may be afraid of

taking chances, and so read too timidly and slowly to reach meaning. Meaning, though, is the goal of reading, and confident but, if necessary, slightly carefree speed is the essence of it.

Student and tutor alike need the courage to operate near the edge of the student's reading ability where meaning is successfully reached almost all the time but where slavish attention to absolutely scrupulous accuracy at every word does not demotivate. We have to avoid barking at print; we seek to promote the fun in reading without exacerbating the fear of it.

Postscript:

When I wrote this book I was an adult literacy tutor. After moving homes as a longer-toothed literacy fanatic I became a volunteer remedial reading tutor in primary school. The general thrust of all the ideas in this book, I was happy to discover, remained perfectly relevant – I still think literacy is literacy, and learning is learning, at any age. But I adopted some techniques more specific to primary school children and one of these was the use of two-handed plays which are read (and only read) with the child.

Despite a lot of looking, I was never able to find any lively and interesting two-handed plays fit for my purposes. The very few that did exist seemed to me to have had the magic simplified right out of them. “It has to be possible to do better than that” I thought. And so it proved. I decided to start writing. My experience in practice with these plays in school was absolutely convincing. They were very attractive to ‘my kids’ who insisted on a play, read their parts with gusto and relish and routinely demanded both scripts to take home to read with friends and family there.

(Note: You will find fifty such plays [here](#))

I hope you will print some off and use them (you will need two scripts as the play-reading experience must be realistic). I also hope you will write your own.

Subjects include jokes, mythology, history, natural history, science and even etymology and Man U. Some are written just to make the readers think. You will notice that almost all lines are short. This is to show the child at a glance that it's not going to be difficult. The language and content are grown-up, so as not to patronise. Where there is difficult vocabulary it is given, first at least, to the tutor's line. I offer some thoughts about writing and using these plays, as well as the inspiring story of 'K' and conversation alongside the collection.

I tell you this in the hope that you will write your own. The kids will love it if you do.

Chapter five notes.

Learning to spell.

Let us look at a thoroughly visual, or visuo-motor, meta-linguistic method; one you already use, perhaps. It is based on *language experience*, which is simply a method which uses a student's own writing to seek relevant material with which to work (and see notes to chapter seven). This method is fundamental. It is a matter of using the student's own work as the raw material for learning to be a confidently autonomous literate, in exactly the same way we all do. It is a matter of learning to look within oneself for the answers. (I believe children today have more than enough work to do, so I will not add to it. I apply the language experience method, therefore, to work they have already written, in notebooks for example, in school.)

A piece of writing is looked at in two modes - first as *author* then as *secretary* (Smith 1982 and see also my notes to chapter seven). Deliberately considering our writing these two ways formalises the approach all good writers follow to correct their own work. I find it helps students deliberately to isolate each role and to do the work of the one in isolation from the other. To bring our target method into clearer focus, undistracted by neighbouring targets.

Considering our writing solely as its author formalises our natural examination of it as artist. We consider it as writing and ask how well it does its work in terms of beauty and efficacy. We do not think at all, in this mode, about the details of our spelling or punctuation. We overlook all such trivia, at this point. We think only whether we like it as a piece of writing. Whether it says what we want it to and nothing we don't want it to. Whether it says what we want it to in the way we want it to. We craft our message and polish our language. We read it aloud to make sure.

When we reach satisfaction as author, though, we pass on to solely secretarial mode. In this mode our writing is no longer thought of in terms of aesthetic value. We eschew such matters altogether and peer at detail. We trawl for important or relevant secretarial errors. Ideally, it is thus trawled independently, by the student himself, and although this process will be facilitated by a tutor in its early stages our aim is to make it a student-driven, autonomous technique as swiftly as possible.

In secretarial mode we look for secretarial detail, and only secretarial detail, for example for spelling and punctuation errors. Ideally it is the student who does this,

although in the early days the technique may have to be demonstrated and facilitated by a tutor. This secretarial examination of writing should be done with a light hand. It is not always necessary, and may be neither useful nor kind, to pick up every error. In particular, writing, in any colour, on student's work is just depressing. The only spelling errors which should be pulled out for work are those which involve common or relevant spellings or spelling ideas or principles and which can be immediately dealt with. The only spellings pulled out should be those upon which work will be immediately done. It is perfectly acceptable to ignore errors which there will be no time to consider, or which are irrelevant or rare. Such errors need not even be pointed out.

Some object to the looseness, the apparent indiscipline, of the language experience approach. It amounts, after all, to working only on whatever happens to turn up, and not necessarily even all of that. Some claim that some letter patterns (vowel digraphs, for example) are so important that they should simply be taught as such, without explicit reference to any student writing or classroom event, using material imported into the learning situation from without (e.g. Hornsby & Shear 1980). I reply that if these patterns really are common they will turn up again shortly and may then be dealt with, and if they don't turn up they weren't that common, were they?

Students are so motivated by learning exactly those spellings they demonstrably need to learn, because they spelled them wrong themselves and proved this, that language experience wins every time as a general methodological approach. Students own their own material. They assuredly do not own the impersonal vowel digraph worksheet. Language experience also teaches what we seek, namely confident autonomy. It's nothing more than the way we do it ourselves. The method, however, suffers, politically, from being somewhat unruly; not lending itself well to planning or to measurement. You may have to be creatively subversive.

How does it work in practice? The student, ideally, working in 'secretary' mode, finds a spelling involving, let us initially say, a common letter pattern which is both wrong and relevant. If this is to be learned (there may be too many errors for one session so we may leave some errors unremarked) we will use the *LCWC / SOS* method for the learning of common letter patterns. I insist on this method for such learning. It delivers faster and more secure learning than any other method I have used or seen. It is readily understood by the student, and becomes their own very quickly. It is a visuo-motor method, involving eye and hand. It eschews the sounds of words, concentrating on letters, letter names and letter patterns.

The *LCWC* method is, of course, the justly famous Fernald '*Look - Cover - Write - Check*' method. *SOS* refers to the not quite so famous Gillingham & Stillman method of

'*Simultaneous Oral Spelling*'. The SOS method is briefly described and assessed in Kirk 1983 pp. 247 – 250.

[Note: Finding examples of letter patterns can be frustrating. I have produced a list of many common patterns for use with the LCWC / SOS method. You can find it [here](#).

This venerable method is best demonstrated using examples. A cardinal starting point is to use only spelling errors produced (and preferably found) by the student (Sam, let us say). Do not point out, or comment upon, any other spelling errors (sufficient unto the day is the evil thereof). Sam only needs to know about those items we are going to use today. He probably suspects there is more wrong, but let us leave it at that.

For learning letter patterns we shall make up spelling cards. These will belong to Sam hereafter.

For example: perhaps Sam writes *vetenary, heffer, agriculter, pasturise, notis, hav, markit, finde, som, toilit and reech*. (These are real examples from a single piece of writing by a student at an agricultural college.) Unless he really needs (or wants) veterinary, heifer, agriculture or pasteurise, ignore these altogether for now. Say and do nothing at all about them. Teach some or all of the others, all of which contain important and common letter patterns. Teach them as letter patterns by LCWC/SOS.

With adults, I make and use 'letter pattern cards', as follows:

Using '*notice*' (misspelt as 'notis') as our example:

Take a nice index card. In the top left hand corner write the letter pattern to be learned. In this case it is *ice*. The card, hereafter, will be referred to NOT as the 'ice' card but as the '**eye - see - ee**' card. We are, and this is extremely important, *learning letter patterns here, NOT sounds*.

In the body of the card write a short list (maximum six, say) of useful, common or relevant words containing the 'ice' pattern - *regardless of their sound*. Put Sam's word 'notice' at the head of this list. In the top right-hand corner of the card I write a line of stars intended to indicate how common or useful I believe the letter pattern is. This card will attract the maximum of 5 stars. This rating system is subjective but will give Sam some help deciding which cards are worth spending the most time on.

After doing some learning there and then with newly acquired spelling cards like this one, Sam will get the card to keep, of course. It will become part of a powerful and

highly personal resource.

There is one proviso; this is that you will find that Sam, after a while, tends to use his spelling cards as a test. Instead of using a card as a gentle, friendly, personal learning aid, he sets himself against it. He competes with it, and it is a competition which he tends to lose (what would be the point if he always 'won', you can hear him thinking). The cards therefore begin to threaten rather than sustain. Using spelling cards as a test, rather than a supportive learning aid, is a *horrible* idea. You should explain the difference with emphatic care.

A card is used as follows:

Sam looks at the letter pattern to see exactly what is to be learned. He looks at the top left hand corner, sees (in this case) 'i c e' and says, aloud, 'eye - see - ee'. He has been trained to 'see', to notice, letter names rather than noises. He makes a mental note that *all the words on the card will contain the letters eye / see / ee*.

He looks at the first word and says it aloud: 'notice'. When feeling confident that he has got hold of the spelling of notice he turns the card over and writes the word, *saying the letter names while doing so* (yes, preferably aloud). (This is the SOS bit, and makes a very noticeable difference to learning)

In other words, 'notice' is written and learned as 'enn - oh - tea - eye - see - ee', NOT as a weird noise (you try saying notice really slowly!). (The 'sounding out' method, apart from being ridiculous with many English spellings for many reasons, also often results in hand and voice getting well out of synch., so that one letter is often being written while a sound relating to quite another is being sounded out. Try it.)

Sam goes on, word by word, in exactly the same vein, until he is happy that the pattern is now under his belt. If he struggles or starts to fail at any point he should immediately stop, take a deep breath and, in his own time, turn the card face up and look at the word he is trying to write, calmly and without panic, saying the letters again. The card, remember, is supposed to be a supportive ally!

When he decides to have another go, he turns the card face down again. *He does not simply copy from card to paper*. Copying words from the card is a waste of time. Nothing will pass through the mind and nothing will therefore be learned.

This technique must be made, and maintained, simple and stress-free; must be kept Sam-friendly and kept firmly under Sam's control. Sam gets the card to keep.

The method, and the reasons for it, should be very carefully explained (and a written *aide memoire* issued if necessary - this is the core and non-negotiable learning procedure for common letter patterns). Sam must undertake to use only LCWC / SOS, to concentrate on letter names and patterns, not to worry about word sounds and not to persist if he feels stressed or threatened.

The 'eye - see - ee' card might finish up like this.

i c e	* * * * *
	notice
	nice
	twice
	ice
	police
	rice

You will notice that in two of the six common words here the letter pattern 'eye see ee' makes a different sound. *This doesn't matter. Do not draw attention to it.* You will find that if you don't point it out the student won't either. Leave it to Sam's unconscious mind to handle. It will do this for him perfectly well, and without pain.

Other cards appropriate to this particular writing episode might include an 'ee - tea' card, an 'eye - enn - dee' card and a 'vee - ee' card. These cards might have lists like 'market, jacket, pocket, toilet, socket, tappet' (if relevant to this student), 'find, mind, wind, window, wind, grind' and 'have, love, give, save, drive, drove'.

You need to note that in several of these very common words our letter patterns are radically differently pronounced (e.g. notice / nice, window / mind, have / save). *This is of no consequence at all.* It should remain unspoken. Students already know how to pronounce these words and are not using sound to learn the patterns they contain. You

should not point out any sound differences. You should, in fact, not point anything out at all other than the letter patterns, by letter names, and methodological demands. We must avoid making a simple matter into a complicated, or fraught one.

The LCWC / SOS method using personal spelling lists by letter pattern is a visuo-motor method and must be thus employed. When a spelling is learned the student needs to think only in terms of letter patterns by letter name. He is using a multi-sensory approach (hand, eye, mental eye (visual memory), mouth and ear). As he writes each letter he names it, aloud. He is simultaneously visualising it from memory. It is important that no stress creeps in. If Sam fumbles, he must stop, turn the card up and start afresh, re-reading the word and the letter pattern. The technique remains under his control at all times. If becoming depressed or enraged, stop.

Many spelling problems will not consist of common patterns, of course. Often, they are words which are composite, like agriculture, or have a singular derivation, like pasteurise. If such words are relevant to, or particularly wanted by, Sam, they should be learned, but differently attacked. LCWC/SOS may still be used to actually learn the spelling, of course, particularly if several related words are useful to Sam – perhaps agriculture, horticulture and agricultural?

Exploring words is often very helpful to students. The word agriculture, for example, derives from Latin (ager, agri) or Greek (agros) a field, and culture, one meaning of which is the growing of plants, stemming from Latin (cultura). Pasteurise, of course, derives simply from Louis Pasteur. This last may also give rise to debate about whether it should be pasteurise or pasteurize and the useful information for students that not all spelling is fixed, that some may differ between different versions of English (US English plumps more often for the -ize ending) and that if a student really prefers, say, -ise endings (I do) he may use them.

In fact, the part of agriculture Sam spelt wrongly (he wrote 'agriculter') is a common pattern, so maybe another way to crack this nut is the LCWC/SOS card way, in a list holding, say, agriculture, pasture, measure, pleasure, culture, future. In this context, I would point out that if 'pasteurise' is relevant to Sam, then I would make sure that he absolutely did not also learn pasture, or -ure pattern words, in the same session. They are much too similar and they will interact and confuse (and see notes to chapter six).

It can be profoundly helpful to discuss the etymology, or derivation, of words with a student. The compound 'agriculture' is logically and historically broken down and revealing its history turns it from an inscrutable and incomprehensible threat into an object of at least a little interest. It will empower Sam.

I would also like to point out that none of the exploration of language described here is referring to sound; it is non-phonetic learning. There is no need to say anything about the sounds of any of these words, parts of words or letter patterns. Sam knows it all already. Let him just learn the spellings!

Listening Skill: a method.

When we talk, the sounds of language blur, merge and even disappear altogether. We do not say “The cat sat on the mat” – we say “’ca’sa’oth’ma’ ”. Only those who already spell will know that cat has a ‘t’ in it. Conversational listening relies heavily on context and uses criteria too woolly and intermittent for spelling purposes. The ‘t’ was simply not there.

When seeking a candidate spelling, one strategy is to replay the sounds of the word, preferably aloud, and listen to the result. To do this, though, you need to *enunciate the word far more precisely* than you do when it comes embedded in a conversational flood of smeary sound. The ear must be much more meticulously “tuned up” for spelling than it is for talk; must train itself to use more finicky criteria and attend to finer detail. This “tuning up” turns out to be “phonemic awareness”.

Phonemic awareness is easily taught. Although even as a novice tutor I could dimly see the need for the skill of accurate listening I did not, initially, realise how easily it can be taught, nor what a difference to performance (and confidence) it makes, cheaply and in a very short time, nor how well and immediately the skill generalises. Using the technique was a real eye-opening experience. My method is as follows:

- **Make lists of words.** Each word should contain only one of two or three alternative sounds which your student confuses and needs to distinguish.

For example: a list might exercise the ear in distinguishing between the sounds of “cl” and “cr”, or those of the “short e” and the “short i”.

in the first case your list might begin “*cream, climb, crumb, clean, declare, creek, clone ...*”

In the second case your list might begin “*will, well, till, bill, end, spend, better, hit, blister, bitter ...*”

- **Explain the need for detailed listening** - how & why this exercise goes in practice.
- **Tell the student which letter or letter patterns to listen for** in an upcoming list. (These may be jotted down as an aide memoire if this is felt helpful – eg “*s/sh*” or “*er/y*” or *a/o*.)
- **Read the list aloud** to the student one word at a time. All the student does is to listen and declare, after each word, which of the letter patterns it contains. The student sings out, for example, either “*bee / ell*” or “*bee / ar*”, (if the list is rehearsing *bl* & *br*) or perhaps “*eye / enn / gee*” or “*why*” (if rehearsing *-ing* or *-y* endings).

Note that the student sings out letter names – not weird noises. Learning to listen precisely is not the same as learning that spelling is primarily a phonic activity!

The student is very specifically not asked to do any more than recognise the previously agreed letter patterns, particularly not to spell any of the words. This must be made clear from the very beginning. The exercise is pure listening, pure aural letter pattern discrimination, nothing more.

Place the student under no additional pressure – such a choice exercise is stress enough. Make sure that you allow time to assimilate and that the student can “hear” any errors before banging on. As with any such exercise, if it doesn’t go well and easily, stop. Keep it light and this will make a cheerful break with big payoffs in terms of learning to listen accurately and of becoming just a little, but precious, bit more confidently autonomous.

[Note: An account of this method, as well as a plethora of lists of words for use when using the method, is available [here](#). Making the lists ate a lot of time, so you will save some by looking in there.]

Roofs: Ar Thay Enny Uce?

(The trouble with rules)

Daddy telled me a story!
It was a funny story, wasn't it?
I didn't thought it was funny!
Didn't you? I did!

Consider this short but typical conversation between a Mum and her toddler daughter. Mum doesn't correct either of her offspring's grammatical errors. Why not? First, it must bashfully be admitted, Mum doesn't know enough herself. Secondly, her daughter isn't mentally equipped to understand an explanation. Thirdly, the child would be bored and intimidated by such explanation. She would be wary of opening her mouth again at least in the presence of her mother, perhaps at all. And, of course, the explanation would be almost instantly forgotten – it would be so manifestly somewhere other than 'where it's at'.

Those of us who have at all recently learned a new language know that a conscious knowledge of, and concentration on, the 'rules' of its grammar gets seriously into the way of the learning, and especially the production, of it. This is precisely because, in such case, we have been trained to invoke our conscious and not simply to trust our unconscious (and see notes to chapter six).

*The centipede was happy, quite,
Until the toad, in fun,
Said 'Pray, which leg goes after which?'*
*This worked his mind to such a pitch
He lay, distracted, in a ditch
Considering how to run.*
(Watts 1957. p.47)

Grammar will not, in the best conversational language courses, be overtly taught for this reason, although grammatical conventions will underly course structure so that grammar is learnt, as children do it, *unconsciously*. We still don't know how the mind does this so are best advised not to teach our grandmother to suck eggs.

As with grammar, so with spelling.

Spelling rules are, self-evidently it seems to me, boring and unmemorable, mysterious, frightening and unreliable. Nobody is going to argue with much of that, probably. However, I also think that spelling rules (like grammatical rules) are psychologically expensive, and that they *disable*.

The first point is relatively easily demonstrated. 'G usually says /j/ when the next letter is E, I or Y.' (Hornby & Shears' *Alpha to Omega*) or 'Words of one syllable ending in F, L or S double that letter after a short vowel.' (Joy Pollock's *Signposts to Spelling*) or 'In one syllable words with a short vowel sound we must double the last consonant before adding an ending beginning with a vowel.' (Allan's *Logical Spelling*)

I think it is intuitively clear that managing spelling by reference to rules would be an expensive way to do this job. It would also, given the number of exceptions, the difficulty of specifying what is to be treated as exceptional and the fact that many of the commonest words in our language are exceptional, be an unreliable way as well. More importantly, I am certain that a knowledge of rules disables.

'i before e' is no help to me:

I have long appreciated, watching my own and others' spelling behaviour, the effect I call '*i before e is no help to me*'. (I only really know one spelling rule – how many do you?) I have noticed that I can write language full of irregularities and oddities without a single conscious thought for spelling. I have no difficulty (I spell well). Then I come upon an 'i' and an 'e' in juxtaposition. Here I have to stop writing altogether, leave 'author' mode and enter 'secretary' mode. I have to fetch the silly ditty out, repeat it and compare it with my 'i' and 'e'. (Are they near a 'c' and, if so, are they before or after it?) I have to decide which way about the now-wretched letters go, write that down and then try to become a writer again as best I can.

'*Receipt*' is a perfect example of the effect in a single word. I do not have to think at all about the weird, foreign and historical 'p' in there, it just falls off my pen, but I have to waste many laborious (and conscious) spelling seconds on the much more common and regular 'i' and 'e'. I do not know how it is I recall the irregular bits in receipt, but it's manifestly easier than the rather regular l & e bit. It's infuriating. Thank God I know only one rule. And what a pity my primary teacher did.

Is there any alternative to learning by rules?

One model of possible circuitry is the '*pattern associator*' last seen in the notes to chapter 2. If associative learning is true, and if processing really is parallel and distributed, if enormous quantities of stuff can be independently and variously managed in different sites at the same time, there is then the distinct possibility that we learn everything simply in terms of associated patterns and also that we very easily learn very large numbers of such associations, and patterns of associations.

After a little bit of pattern learning the mind will begin to behave in an apparently 'rule-bound' way, to behave as if it knew, and consulted, rules before acting. As you can see in the scenario here drawn, this is an illusion as *there are no rules in there at all*. Learning is very possibly simply the arrangement of connections between cells into pattern associator nets, which '...allows a network of simple units to act *as though* it knew the rules.' (Rumelhart & McClelland 1986 p.32, their emphasis)

So here we all perhaps are, a colossal collection of pattern associators in a vast and elaborately interconnected network of networks of networks. Everything we have learned has been built into the circuitry as we learned it, without the need for a single rule to be specified. In fact it is much simpler and more robust for not having any rules to which the associators need refer. It is also more flexible, much better able to cope with a new idea than a rule-based system would be. It can readily assign a likely meaning even to imperfect inputs.

This is a stunning, shocking notion which, once you are used to it, is profoundly elegant, even voluptuous. We operate with so many pattern associators that we produce behaviour apparently meticulously controlled by rules, with absolutely no knowledge of any such thing. Nowhere in the system need any spelling rules be described in order for us to produce excellent spelling! Since pattern associators are able to do their associating even when input is imperfect, we can even read, for example, handwriting or misspellings without difficulty or the need to revise any previously learned 'rules'.

And, of course, it turns out that we all 'knew' this anyway.

We all, for example, produce language of complexity and grace and acknowledge that we do this with (at least in my case) not the slightest real knowledge of any of the 'rules' of grammar or syntax. We are all, more or less dimly, aware that grammar is complicated and ramifies into the distance almost as far as the eye can see. Thus it is also with spelling rules. We are, initially, shocked by the idea that we might not know

any rules at all but perhaps, having some idea how Byzantine and exception-ridden English spelling rules are, we ought to have been more astonished at the idea that we could learn, and so easily apply, a system so complex by deploying rules?

Is that idea any less outrageous than the idea that we learn by simply wiring up little pattern associator circuits (albeit in large numbers) completely innocent of rules? And pattern associators have one enormous advantage - they do their work in our subconscious; we do not have to 'think' in order to operate them. Indeed, perhaps the more we try to think about them, to influence them, the less well they perform?

While learned pattern association goes on in the unfathomable and practically unlimited unconscious, thinking about rules has to take place in the hectic and very limited conscious. If there is the slightest chance of getting the subconscious to look after any process for us, we should gratefully seize it. (This is, of course, precisely what practice achieves.) To learn a rule before the patterns to which it will apparently apply have been 'overlearned', simply as patterns, to subconscious standard, is to risk the patterns forever thereafter having to be referred up to conscious thought for decision and execution whenever they occur. ('i before e ...') A student who is taught to learn spelling rules before patterns has their capacity 'just to write' spiked, in fact.

This is the principle on which the best conversational language courses now function and we should take a leaf from their book. Modern courses deliver grammatical fluency astonishingly quickly and securely. They do this, paradoxically, by eschewing any teaching, indeed any mention, of grammar *per se*. Grammar is introduced stepwise and logically, but covertly. Typically, a session will be built around a single, but unmentioned, grammatical reality (a particular tense for example) and the ostensible targets of tuition - vocabulary, idiom, intonation etc. - presented, and practised, within the setting of that grammatical reality. Students learn, very rapidly and very dependably, how the particular grammatical construction they didn't realise they were learning 'feels' or 'tastes' in the new language.

Such internalised learning 'makes sense'; it will stick. It will also, of course, remain painlessly, yet absolutely reliably, in the subconscious.

The student, in other words, has been allowed to learn in his or her own mysterious way, presumably in the same way we all learned the grammar of our own native tongue as tiny infants. How we all achieved this is still an enigma. The idea that we learned complicated, convoluted rules (which none of the adults about us were able to enunciate) is only one hypothesis, and a wobbly one at that. However we managed it we can assume that it was by the most effective and economical method. Intuition tells

us that seeking and learning rules is 'learning about language rather than learning language'. Intuition is, surely, often right?

Our aim is, once again, confident autonomy. There are many other metalinguistic methods we all use in our own lives and which are particularly valuable in ABE. They include roots, relations and history; parts, wholes, morphemes and patterns; and WIDWIO. Making the metacognition of these clear enlightens, and enlightenment enables and empowers.

Roots, relations and history: A difficult spelling can be made easier by stripping it back to its roots and rebuilding it. For example, a student insisted on using the word 'muddleheadedness'. This is impossible if left in one piece. It took him maybe fifteen minutes to strip it down to its four components but he learned the principle while doing this and was much faster and more confident with subsequent challenges. He also deliberately built the technique into his repertoire (metacognition in action). The technique can work the other way; the same student had problems with 'design' (that 'g'). He came successfully at it by thinking his way to 'designation' and stripping that down again. Another student had a desire to write 'manufacture'. The dictionary told us that *manus* was Latin for hand, hence manual and manuscript, and that *factorium* was Latin for oil press. After that the only problem was the '-ure' ending which was learned using the letter pattern spelling card LCWC / SOS system as above with a four star list like 'manufacture, picture, pleasure, measure & furniture'. Yet another student fell for the word 'catastrophe'. This comes straight from the Greek *katastrophe* which at least explains the 'ph'. A student who worked in the health service was enchanted to find that 'hospital' originates from Latin *hospitalis* which meant hospitable, warmly receiving guests.

All this sort of exploration of words takes a little time, some particular expertise (students need to be *au fait* with the alphabet, for instance) and a good and etymological dictionary (I like the Concise Oxford), but it pays off in motivating interest and understanding, replacing fear of the language with respect and affection for it. It also puts the student in the driving seat, revolutionising his attitude to words.

Parts & wholes, morphemes and patterns: In short – rummaging around inside words. There are always easy bits and hard bits, the bits you already know (or could work out) and the odd or unknown bit(s). Metacognition helps here too. There is overlap with the immediately above, of course. As in 'hospitalisation' where you seek roots and also recognise morphemes ('ise' and 'ation'), one of which is modified by application of the well known 'drop the e' procedure.

Chuntering around in words like this can reduce the load on long term memory and working memory considerably. The more it is possible to lay aside as already understood, and the more it is possible to reduce what cannot be laid aside but must be addressed and learned, the less hectic and stressed the activity, the less dire and more enjoyable, and the more productive. Students learn to pace, select and prioritise if such technique is made overtly clear – made available as a metacognitive technique. For example, all you need to remember, probably, with ‘write’ and ‘writing’ is that ‘w’, while ‘system’ only really contains one problem, with its ‘y’, and ‘doubt’ is easy but for the ‘b’ which pops out at you in ‘dubious’. Many ‘easy bits’ are morphemes which happen again and again – all those -ed’s, -ness’s, un’s and -ing’s. Once some letter patterns are learned the number of easy bits to recognise will rise rapidly, especially in the early days of learning.

WIDWIO: or When In Doubt, Write It Out.

This is simply what many fluent literates do when doubtful about a spelling – we just write it down and look at it. If it looks right, we consider that it probably is; if not, we seek and write down alternatives and look at them. This takes confidence in the ability to see wrong spellings (even early students can do this better than they might think) and the ability to think of candidate and alternative candidate spellings (this ability itself very much affected by confidence). For these two reasons ABE students can take some time to become really confident with WIDWIO. They will be pleasantly surprised by how well they recognise spelling error by sight, but may find thinking up alternative spellings rather more difficult. This is such a powerful and common technique (and students need to know this) that it is worth persevering, nonetheless. WIDWIO delivers that little bit more confident autonomy, and confident autonomy is exactly what we are after.

Here I must insert a tiny, but important, addendum.

I have been writing with my adult literacy hat on, assuming that the raw material - the student’s writing – simply exists. Certainly, the student’s own writing must be the substrate upon which tuition operates, but whereas an adult may be asked to produce some as ‘homework’ a child, in my opinion, should not. The modern child has a mountain of extra work demanded by their school – we should not, in all conscience, add to this! (We aim to support, not oppress.)

The raw material for our purposes here – the child’s writing – can be found in their schoolwork, which is, happily, already written. The techniques described above can be deployed on this work; the child will be empowered by our facilitation of their own critique of it.

Chapter six notes.

Consciousness and literacy: does it matter?

Or:

Maybe I think too much?

(N.B. You may also like to look at a somewhat shorter, possibly more elegant and certainly more deliberately pedagogically targeted, article on this important, but rather new, subject [here](#) . The article is called '*Conscious and unconscious minds: Implications for teaching and learning literacy*'.)

Back in these notes, however:

Let us take a speculative and rather wary ramble up towards the last frontiers of psychology and philosophy. The undergrowth is high and thorny in this part of the intellectual forest, as a few quotes will confirm.

'The nature of consciousness has proved ... elusive, ambiguous and questionable ...' (Smith & Jokic 2003 p.1) 'Science's failure to get to grips with consciousness gradually became an embarrassment.' (McCrone 1999 p.6) 'Consciousness is what makes the mind-body problem really intractable... Without consciousness the mind-body problem would be much less interesting. With consciousness it seems hopeless.' (Nagel, in Block et al 1997 p. 519) and 'Consciousness is a fascinating but elusive phenomenon: it is impossible to specify what it is, what it does or why it evolved. Nothing worth reading has been written about it.' (Sutherland 1995 in Block et al 1997 p. 8)

Oh well...

It has only relatively recently become respectable to debate this issue at all. It has been regarded as absolutely out of psychological bounds, and as thoroughly dubious philosophically. The debate is getting into its stride now, though, and is subject to intense philosophical and psychological rumination and considerable neurological research. I have found nothing much in 'the literature' about the possible influence of consciousness and unconsciousness on the theory and practice of teaching and learning, although it seems to me that this influence may soon be regarded as quite considerable. Here, I present a taste of the exhilarating, if intermittently bewildering, arguments to come. That I am writing about this subject is assuredly not to be taken as suggesting any special expertise in it. I am no more expert than you are. I merely raise

some perplexing issues which it seems to me are of educational interest. Nobody else is doing this, so far as I know.

These notes will ponder three and a half questions: How sovereign is our consciousness, how useful is it (and for what) and what effect might it have on learning? I seek to undermine your faith in your conscious but to bolster your belief in your unconscious; to outline a theoretical framework which may support our intuition that, sometimes, we do indeed think too much – that at least some learning is not helped by intellectualising it. Some learning is disadvantaged, perhaps, by applying the conscious mind to it.

Why does the question grumble? The idea that my conscious played (very) second fiddle to my unconscious and that in certain circumstances it might be unimportant, perhaps sometimes even actually unhelpful, particularly to learning and particularly to certain kinds of learning, came into my head years ago. It still grumbles about in there. Why did I have this idea in the first place? I found I hated certain teaching or learning methods quite unreasonably (for example using spelling 'rules' as a teaching method, but also the overt learning of Welsh grammar which was forced upon me when I learned that language as an adult).

These methods felt unnatural and toxic; they felt as if they literally rubbed my mind the wrong way; they grated and chafed. Their common denominator seemed to be that they all involved the deliberate application of my consciousness to learning detail or considering items I suspected were meaningless or unreal. They made me think consciously about stuff I felt was peripheral and counterproductive, in ways I felt were aberrant and did not suit the apparatus in my head. I came to fear the 'explanation', the giving of 'reasons' and, most of all, the elaboration of complex and only intermittently true 'rules'. The kind of thinking these methods induced made simple stuff complicated and natural stuff unnatural – or so I felt.

Teaching me overt, explicit grammar was to insist that I think consciously about the rules of the language I was being expected to learn – in the old cliché, to learn about the language rather than to learn the language. It seemed to be precisely this requirement to intellectualise which seemed to complicate learning and which made it so scary.

Thinking too much, or perhaps it was thinking inappropriately or about the wrong things in the situation, seemed to get in the way of learning. It seemed to interfere with fluent performance. It intimidated and demoralised as a result. I felt then that something was peculiarly wrong, and I still do now.

Philosophically, the subject of consciousness is shot through with profound paradox. Some intuitive disciplines recognise the inherent paradoxicality of consciousness and its study and have addressed this issue succinctly, at least at the practical level. Buddhism seems to deal with consciousness by cheerfully admitting that it is a fundamental paradox and can best, perhaps only, be resolved through unquestioning acceptance. Consciousness simply is, they say. No problem, they say. We in the restless and materialist West, however, abhor enigma and we seem to find this one a thoroughgoing irritant. We fret insistently about it. What *is* consciousness? What (if anything) is it *for*? Is it really necessary, or even a Good Idea? Did it really evolve, through natural selection?

There are two questions for science and philosophy to answer, one is the easy question and one is the famous 'hard question' (Chalmers 1996 p. xii). The 'easy question' (it will one day be answered) is how? What mechanisms make consciousness happen? What loops and feedback systems in the brain, for example, might do that? Difficult, but not insoluble. The 'hard question', though, may be unanswerable. Indeed, some thinkers claim it will forever be beyond our grasp, almost by definition. It is the *why* question – why do we have consciousness; what does it do and what is it for?

A & P consciousness: What do I mean by 'consciousness', the subject being so bedeviled by the problem of clear definition?

Many writers consider there are two of them, two psychologically distinct consciousnesses (e.g. several contributors to Block *et al* 1997). Many writers distinguish between *phenomenal* or *P consciousness* and *access* or *A consciousness*.

P consciousness is the consciousness of being; the awareness of ourselves, sometimes our awareness of our awareness and even our awareness of our awareness of our awareness. By contrast, A consciousness is the awareness of our immediate circumstances but without self awareness (Damasio 2000). A consciousness is not controversial; it is P consciousness which causes all the debate. (e.g. Block *et al* 1997, Chalmers 1996, Damasio 2000 & 2004, Edelman & Tononi 2000, Metzinger 1995, Nørretranders 1998, Smith & Jovic 2003.)

These notes will consider 'consciousness' to be P consciousness – that 'thinking' of which we are aware in the sense of being aware that we are doing it and aware of this awareness. When we are P conscious we experience being a being with thoughts. We are aware of these thoughts but also of being a being who is aware of them. All other mental activity I will call unconscious activity, since we do not become aware of doing it;

since we do not do it in a state of self-awareness. This seems to me to be a simplification which will help us understand learning better – the removal of all thought of which we do not (perhaps often cannot) become aware as *unconscious* thought.

People who suffer *petit mal* epileptic seizures illustrate the difference between A & P consciousness. They can sometimes, when struck by a mild seizure, continue successfully to drink their tea, walk through crowds or whatever they were doing when the seizure struck (Block, in Block et al 1997, Damasio 2000). They appear objectively to be rather 'wooden' at such times and they report subjectively that they lose conscious awareness. They go on doing things quite well but lose the awareness that they are someone who is doing these things. Subjectively they report complete loss of consciousness, in fact. They behave appropriately in the world, but do not 'know' they are behaving. They cease to be aware that they are someone doing things. They retain, in other words, A consciousness but they temporarily lose P consciousness. They become, in effect, temporary zombies.

A zombie knows about his immediate circumstances, he just doesn't know that he is a creature who knows about his circumstances. But, despite having A consciousness a zombie isn't what I call conscious. That is why when I say 'conscious', hereafter, I will mean 'P conscious'.

And it is an astonishing, fabulous thing, consciousness, if somewhat inexplicable. It is astonishing that our brain, which is some 1,500 grams of soggy, grey tissue with the consistency of blancmange, can produce within its apparently so unpromising self a richly imagined, vividly intense world full of colour and sound, beauty or horror, sorrow or joy, reason or passion, pain or ecstasy and the astonishing awareness of these sensations and thoughts and of the self experiencing them. Physical brains and conscious experience are such radically different things that it is an absolutely 'astonishing hypothesis' that the one should give rise to the other (Crick 1994).

As we have seen, two questions force themselves upon our attention: why and how? The first is pure philosophy and I cannot do justice to, or even adequately follow, the arguments. My feelings about this aspect of the subject might be distilled into the following lovely quote: 'There is a feeling of intense confusion, but no clear idea about where the confusion lies.' (McGinn in Pinker (1997) p. 558). Much reading has left me approximately where I was before I began. All I can do is point you towards some interesting literature, wish you luck and remind you that Pinker (1997) suggests that our species may be inherently incapable of reaching a conclusion to the why of its own mind. This member of the species certainly is.

Useful texts include Block *et al* 1997, Burwood *et al* 1999, Chalmers 1996, Damasio 1996, 2000 & 2003, Hodgkiss 2001, MacPhail 1998, McCrone 1999, Metzinger 1995, Nørretranders 1998, Pinker 1997 & Smith & Jokic 2003 and perhaps especially Wegner 2002 and Welshon 2011.

The neuropsychological question (the easy one) is how? How do the aforementioned 1,500 grey, soggy grams of dense nervous tissue produce consciousness? How may consciousness arise? This is a relatively straightforward question and will be answered, in outline, one day, possibly fairly soon. It is 'merely' a question of wiring and procedures. With steadily improving investigative tools neurologists will eventually solve it. Much theory already exists (e.g. Cotterill 1997, Crick 1994, Edelman & Tononi 2000, Greenfield 1995 & 1998, Newman 1997, Nørretranders 1998, Parvizi & Damasio 2001, Smith & Jokic 2003, Wegner 2002, Welshon 2011).

Many neuropsychologists envisage consciousness as *feedback* (e.g. Crick 1994, Damasio 2000, Edelman & Tononi 2000, Greenfield 1995 & 1998, Newman 1997). They suggest that some of what is going on in the unconscious reverberates around feedback loop circuits and is, somehow, re-presented to the mind which therefore re-experiences something it has just experienced unconsciously. This re-experiencing is thought to be the event of which we become conscious, the mental event of which we become consciously aware. (Whatever that means! We must, philosophically speaking, take care. There is no Cartesian 'theatre' in your head where you sit watching consciousness roll. There is no 'you', separate from your mind, to watch it. The tiny homunculus, who used to be envisaged sitting in the mind and 'seeing' what was going on in there, does not exist. There is 'just' the mind, or the mind-event. There is no-one to experience it, only the experience itself. Very Zen. Consciousness is also nowhere in particular – there is no 'seat of consciousness' in the brain – it is probably more a matter of degrees of excitation, particular states of arousal, wherever that activity may, for the moment, be taking place.)

In the words of Greenfield, consciousness may be mediated through

'... shifting populations of neuronal networks ...' (1995 p. 34) such that it is "... spatially multiple yet effectively single at any one time. It is an emergent property of non-committed and divergent groups of neurons that is continuously variable with respect to and always entailing a stimulus epicenter.' (ibid. p. 97).

There is no specific site of consciousness, which is a phenomenon of widespread excitation of networks which are 'non committed' – you can be conscious of almost

anything, almost anywhere in your cortex where relevant excitation occurs, and may become conscious of many aspects of whatever the original 'stimulus epicenter' was.

A popular candidate for the actual machinery of the postulated feedback system is the *reticular activating system* projecting basic information from brainstem to thalamus and thence the extensive mesh of loops which are known to project both ways between the thalamus and the cerebral cortex, especially the frontal cortex. (e.g. Damasio 2000, Edelman & Tononi 2000, Newman 1997, Parvizi & Damasio 2001) Perhaps mental activities in the cortex are fed back to the thalamus, modified again there and re-projected to the cortex. At any rate, we are speculatively envisaging a reverberating, re-experience experience; material from the unconscious passing round feedback loops and reappearing within the cortex as a new set of stimuli, perhaps amplified stimuli, and, perhaps as a result of this amplification, now consciously experienced stimuli.

The whole process probably remains under unconscious direction and control. If the conscious has a purpose, it is probably directed to it unconsciously – the unconscious may, in other words, ask the conscious to carry out work but it may be work the unconscious has decided to have done for its own, eternally inscrutable purposes (e.g. the allocation of attention & see Reimer 2006). Perhaps my unconscious is the real 'me' and uses my conscious as if it were a torch, to illuminate anything it wants a second or better or particular kind of look at? It is, in yet other words, entirely possible that the conscious is very much the junior partner in such collaboration. It is also entirely possible that it is not called into action all the time – there may be periods when we are, in effect, simply zombies, simply A conscious, being 'run' entirely by what I am calling our unconscious. (Do you ever have that 'how did I get here?' experience?) (And see Goldberg *et al* 2006.)

That was a preliminary stab at the easy question. The answers, should they ever materialise, will be fascinating. They will not, though, answer our hard question, which is *why?* What is consciousness *for*? What does it *do*?

At first glance this seems a daft question. It seems perfectly self-evident that 'I' am in complete control, if not of my feelings at least of my thoughts and actions. This 'I' who is so in control is, naturally, my conscious, aware self. It seems preposterous, perhaps even pointless, to question the belief I have lived with for so long, so successfully and for which I seem to have such incontrovertible, if circumstantial, evidence. We feel as if we live within our conscious which is, by definition, the only mental activity of which we are aware. Because of this we see all intellectual activity as conscious activity, consciously managed. If we think about it at all we envisage the unconscious as managing all the low level, automatic, A consciousness stuff – enabling us to walk and

chew gum at the same time, for example. We imagine all our real thinking, all thinking of much value, is done within our conscious. How could it be otherwise, we cry?

This is where the debate tends to bring on a headache, where reality seems to flip into mirage and vice versa. You think you are reading this with your conscious mind. It certainly feels as if I am writing it with mine. However, this is only a fabulous illusion. Logic and experiment easily reveal this disturbing truth. We actually live in our unconscious. We *are* our unconscious. (Which is why we can be uncertain as to who we “really” are.) Every mental thing is initially done in our unconscious. We become conscious of only a miniscule fraction of the result. It is not clear why this happens – why we become conscious at all – and it is not clear how useful, or otherwise, this consciousness of ours really is. It sometimes seems to be a rather pointless and intermittent appendage, in fact, dealing in a rather second rate manner with second hand material already managed perfectly well in the unconscious.

A thought-provoking stab at teasing out what consciousness might be for, even though it is entirely illusory, is provided by Daniel Wegner:

“Although it is sobering and ultimately accurate to call all this an illusion, it is a mistake to conclude that the illusory is trivial ... It is only with the feeling of conscious will that we can begin to solve the problems of knowing who we are as individuals, of discerning what we can and cannot do, and of judging ourselves morally ... Our sense of being a conscious agent who does things comes at a cost of being technically wrong all the time. The feeling of doing is how it seems, not what it is – but that is as it should be. All is well because the illusion makes us human.”
(2002 p. 341)

To begin with a whizz through some logic:

Hector Projector and the half second delay:

All mental activity, of whatever kind or degree, happens in the brain. The mechanism the brain uses is electrical circuitry. Every thought or feeling, however rare or wonderful, is also, and by definition, a collection of microvoltages, microresistances, chemical reactions and particular connections among particular circuits. There is no other way to have a thought. The P conscious ‘me’ has no idea how all this is done and, even if ‘I’ did I have neither the time nor the capacity to manage it successfully – even for an instant. I cannot, consciously do it. At all. My unconscious, therefore, has to do it for me and then, perhaps, present me with some of the results.

In other words, whatever I think I am thinking, deciding or feeling has already been thought, decided or felt in my unconscious.

Not only that: my P conscious is only able to handle refined, developed, meaningful concepts. All such concepts are, by definition, constructs. They are constructed from countless, absolutely minute pieces of data. These myriad data are almost completely meaningless in themselves. Someone has to gather them, prioritise them, correlate them and make meaning from them; condense and simplify them into concept.

Only my unconscious can do this. It is a task which is well beyond my conscious.

Vision will do very well as an example. Literally millions of bits of visual information pour into my brain along my optic nerves; a mass, or mess, of details of light and dark, intensities and colours, shapes, edges, surfaces, curves and corners, some of it changing from moment to moment. There is light and shadow, stillness and motion, greys, browns, greens, yellows and blues. My long-suffering brain sorts all of this material out unconsciously, 'I' don't know how, and gives me the answer. After unbelievably complicated computing (as researchers into vision find, to their cost and alarm, when they try to model it) my unconscious is able to tell my conscious that I am looking at a blue tit skipping around in the depths of a privet hedge. A complexity of detail has, swiftly and apparently effortlessly, been reduced to a simplicity of concept; a meaning of which 'I' can be made consciously aware.

We have immediately to admit that 'I' – my conscious self – could never have taken in, never mind usefully processed, all this detail, this plethora of information which is yet managed so routinely by my unconscious. There is simply no way the conscious could direct all that detailed circuitry which, after all, it knows practically nothing about. We are driven to accept that 'I' would be utterly unable to function without 'my' fabulous unconscious digesting, analysing and representing reality for me. It follows logically, I am sorry to say, that whatever 'I' consciously experience at any moment must already have been experienced by my unconscious. Not only that, of course, but it follows from this that whatever my conscious is experiencing is simply an invention of my unconscious. It is an entirely virtual "reality".

Logic suggests that there must be a time lag between what goes on in the unconscious and the echo of part of it in the conscious. Has anyone tried to measure this gap and, if so, how long is it? Has the time between the first stirrings towards thought or decision within the unconscious and the awareness of thought or decision within the conscious been quantified?

I shall describe only one experiment which I hope will amuse you (and see Dennett & Kinsbourne in Block *et al*). It involves Hector Projector (this irreverent terminology being absolutely mine, I hasten to add). The experiment is controversial and, if real at all, is just a whacky update of the kind of work carried out by researchers like Benjamin Libet (see Nørretranders 1998 for less controversial work).

Hector sits facing a screen onto which a slide is being projected from a carousel projector. The carousel is full of slides yet to be projected. On the right arm of his chair is what Hector is told is the control button for the slide projector. Unknown to Hector, however, this button is a dummy – it is not actually connected to the projector, or anything else. It does nothing. Hector's scalp, meanwhile, is fitted with monitors which are capable of detecting very slight changes in brain activity. With devilish cunning the monitors over the hand motor area of the left brain (that area which directs movement of the right hand) are connected up in such a way that whenever they detect rising activity in that motor area they will activate the carousel and project the next slide. Hector is not told this interesting fact, of course. He is just invited to switch to the next slide whenever he likes, by pressing the button provided.

To his astonishment and confusion Hector finds that just as he is about to press the button the slide changes anyway. However he tries, the projector appears always to think for him, and slightly ahead of him. Whenever he decides to press the button and see another slide the machine seems, almost half a second earlier, to have decided exactly the same for itself and is already changing the slide. The projector seems to be (indeed is) reading his mind and anticipating his conscious desires. The machine is, of course, being activated by his unconscious decisions to press for another slide. His real decisions, his unconscious decisions, are being artificially made manifest. It is obvious that these are well ahead of his apparent decisions, his conscious decisions.

The notion of conscious control seems suddenly much less robust, indeed it is clearly mythical. It is all very disconcerting, for a modern man like Hector.

What does this mean? There is indeed a delay between events in the unconscious and their appreciation in the conscious. The gap is close on half a second. The delay between the real, or unconscious, decision to change that slide and the mythical, or conscious, decision to do so, turns out to be between 300 and 500 msecs, from 0.3 to 0.5 seconds (Nørretranders 1998). Our unconscious is ahead of our conscious by this small half second. And thus it will always be.

In other words, as we have just seen logically and experimentally, everything in our

conscious mind has already been managed in our unconscious. Whatever is in the conscious can only, ever, be whatever the unconscious has assembled from data, and by means, only it understands. 'Reality', or my conscious experiencing of it, is inevitably (and literally) an afterthought. It is history. It happened a little under half a second ago. The representation of reality for us by our unconscious is all we can ever (consciously) actually have. There is nothing else. We do not, and cannot, consciously experience reality directly. We never will. What we consciously experience is always a reconstruction. It could be nonsense and is indeed sometimes simply wrong (for example when viewing illusions like the fabulous Ames room and some of our misperceptions and misattributions).

I cannot resist a speculative aside: if the autonomy of our conscious really is illusory, why does it exist? Surely anything it can do the unconscious can do better (indeed probably already has done perfectly well)? Could consciousness be a chance and accidental by-product of building a brain to a certain 'spec.' and then using it in particular and novel ways? Perhaps the potential in a brain the size of ours to reverberate within itself in such a way as to generate foci of excitement in such a particular way as to induce awareness is fortuitous? Might this weird, and possibly biologically pointless, potential have become actual only once we developed language, that essential tool for reflection and synthesis?

Perhaps, in other words, consciousness did not evolve biologically, but socially? (e.g. Tomasello 1999) And if that were true, you have to wonder what other fantastic, but as yet unrealised, potential aptitudes might be lurking in there. In this connection, try Jaynes 1990. Probably not 'right' but may help you see this misty subject more clearly.

We are discussing our conscious and unconscious as if they were quite separate and absolutely different creatures. Are consciousness and unconsciousness distinct and different or are they just two aspects of the same array of mental procedures, two parts of the same psychological animal? Bearing dutifully in mind the important proviso that the psychology of consciousness is in its very early infancy, and 'facts' are thin on the ground, we can nonetheless begin to discern likelihoods and possibilities. And it does seem that the conscious and the unconscious really are radically different. They seem to use radically different processing paradigms, and they seem to have radically different processing capacities. They seem to do things differently, and to be differently effective in different domains.

Estimates have been made of the relative abilities of the conscious and the unconscious (and see Nørretranders 1998). We should not take them too seriously, but they are probably of rather approximately the right order, probably near enough to a truth of

some kind to be valid general thought fodder. The unconscious, when going well, probably processes some eleven million 'bits' of information per second, expressed in computer speak. The conscious, at full stretch, may manage about sixteen. The unconscious may, in other words, be able to deploy about seven hundred thousand times the power of the conscious. The processing capacity of the conscious may be only about 0.0000014 that of the unconscious!

Not only that, but the two mental 'organs' use different processing paradigms. We know that the conscious processes information slowly and serially, one item at a time, one plodding snippet after another. We also know that the unconscious, in contrast, processes information rapidly, in a parallel, all-over-the-brain-at-the-same-time, hugely multiple and incalculably interconnected way. The conscious, to draw an imperfect analogy, functions like a single, and rather basic, computer whereas the unconscious behaves more like a huge number of computers connected together at all times and able to operate and communicate simultaneously.

Your conscious, and your unconscious, in other words, seem to be very different creatures. The unconscious is fast, global, holistic and smart. The conscious is embarrassingly ponderous, serial, local and limited. The unconscious probably supplies and manages the conscious, but, if they really are radically different then they probably operate radically different learning paradigms and learn in radically different ways. They probably even learn radically different things and it is possible that they evolved to do exactly this.

To summarise thus far: The notion that our P conscious directs, & carries out, all important mental business is a very natural illusion. The brain is almost entirely an unconscious organ, it does everything unconsciously first. Consciousness is a rather small and imperfect add-on of rather unclear purpose. Logic dictates this and experiment concurs, showing that the unconscious does the business a small half second ahead of the conscious. Consciousness is possibly the result of reverberation, feedback among the brain's circuitry, perhaps among thalamo-cortical loops. Consciousness may be a re-experience experience; material from within the unconscious travelling round feedback loops and being somehow re-presented to mind. Consciousness and unconsciousness seem to be radically different, with radically different behaviours and capacities. The one is swift, huge and global, the other ponderous, small and local. The unconscious mind is parallel, while the conscious mind is serial. The unconscious probably deploys consciousness for its own purposes, at times of its own choosing and in its own preferred ways.

How might all this affect learning? Since consciousness is small, sluggish and serial it

seems to me that it may be unnatural and restrictive to demand that it be set to assimilating detail, learning facts; that may not be what it's for. Perhaps there are two kinds of learning – the understanding of conceptual ideas and the assimilation of facts? Perhaps meta-cognitive understanding demands consciousness while the unconscious is the genius of assimilation? Perhaps, once structures are understood, 'facts' are merely exemplars, nonchalantly absorbed without our having to know how?

One reason to be wary of deliberately using consciousness when learning simple items, when trying to assimilate basic data, is its relative incompetence. Consciousness is extremely ponderous, and unremittingly serial. This intellectualised, self-aware, serial paradigm seems to me to make the learning of data awkward, difficult, unreliable and threatening. This is because serial consideration is probably a highly unnatural way for mind to behave when it is merely assimilating data. It probably accords data far too great an importance, makes the tiny 'fact' seem huge and mental capacity small. Conscious data learning may become intimidating, a hostile experience conducive to the development of aversion or learned helplessness, as a result of this concentration on small meaning but great detail. Does the conscious yearn for meaning and find detail trivial? Will the experience of an apparent inability to manage trivia erode confidence?

Let us invoke a few practical examples to inform this discussion. First, let us imagine an English for non-speakers class where the teacher is saying something like this:

"There are two present tenses in the English language; one is the present continuous and one the present simple. Example: I am going and I go. We will now learn these two tenses, beginning with the present continuous.

"The present continuous is used in the following circumstances:

- For an action happening now (it is raining).
- For an action happening about this time but not necessarily at the moment of speaking (I am reading Catch 22).
- For a definite arrangement in the near future (I am meeting her on Wednesday).
- With always for a frequently repeated action usually when the frequency annoys the speaker or seems unreasonable (Tom is always going away for weekends).

"Some verbs do not usually take the present continuous:

- Verbs of the senses (feel, see, hear etc.).
- Verbs expressing feelings or emotions (feel, respect, love, hate etc.).
- Verbs of mental activity (agree, understand, think, forget, remember etc.)."

And on and on. And we are not yet even at the end of the ramifications of the present continuous, never mind the start of those of the present simple. (I am, incidentally, indebted to Thompson & Martinet 1986 for the information delivered above. I can assure you I did not 'know' this myself.)

This may appear a fantastical example but it is barely a caricature of what could be seen in second language classrooms not all that long ago. I have been there and I have had to do this. Students, faced with such a barrage of intellectualisation, of course, learn many things. They learn that English is impossibly complicated and infested with opaque rules and arbitrary exceptions to them. They learn that learning English is intimidating, demoralising, demanding, difficult and dull. They learn that they will probably be able to master very little of it and will probably never perform it fluently. The less secure among them even learn that they must themselves be rather dim, since you can hear native speaking toddlers getting this stuff right all the time. Technically, the main thing they learn is probably that in order to produce correct English a great deal of conscious thought has to be undertaken. Is this action happening now, or shortly? Is it something regularly done? Is the verb one of sensation or emotion? Is it one of mental activity? Is the word 'always' anywhere to be seen and how irritated am I by the action? Am I describing a definite arrangement in the future, but not all that distant future?

And remember the memory experiment I describe in chapter four, where items were inadvertently, but better, memorised by subjects who had been instructed to look consciously only at categorising them. You will recall that it was found that one group, who were asked merely to memorise some 100 words on 100 cards in a limited time recalled many fewer than did a second group who were simply asked to sort the cards into categories over the same limited time, not asked to memorise them at all. Group one's conscious attention was directed to (and taken up by) one task, the memorisation of items meaningless in themselves and the carrying out of a meaningless task. The second group's conscious attention was directed to finding some meaning among the items. In the event, group two inadvertently memorised a great many more of the details without even being asked to. The conscious attention of the two groups was directed in radically different directions, and made to do radically different things, *by the researcher*. One group's conscious attention was directed, by the researcher, to a meaningless attempt to memorise trivia, the other group's attention was directed, by the researcher, to the discovery and building of meaning.

And a final example: On the wall of an adult literacy classroom I frequent there is a series of elaborate, handmade poster displays about homophones. One lays '*there*', '*their*' and '*they're*' out in detail. These posters seem to me more likely to threaten and

confuse than enlighten or educate, but why? Perhaps it is because all three spellings are, of course, largely conventions and only one contains a common letter pattern. They are not homophonic as a result of anything meaningful – this relationship is chance and insignificant.

The mind of the unfortunate reader is being instructed consciously to consider inherently meaningless material, pure post-factum convention. Consciousness is being deliberately focussed where there is little or no real structure, pattern or understanding, no inherent meaning and small interest. Their presence on the wall, however, is a reminder that there is, or will be, pressure to learn these extraordinary things; there is threat in these posters. This is precisely the kind of material the conscious finds difficult to learn – very similar items closely juxtaposed but not related or differentiated by any meaningful structure or pattern. The mind finds no meaning onto which it may hang such spellings and will react by becoming anxious.

Directing consciousness:

And the nub of the debate, the practical centre of the argument, is that the researcher, the teacher, or the learning situation, always directs conscious attention one way or another. The deployment of conscious attention is inevitable, though where and how is also often a neglected matter of choice. A teacher, or system, invariably sets up an educational situation such that students direct their conscious at particular subjects and in particular ways. It is inevitable. It is time we recognised this and examined its effects and how we might more deliberately structure circumstances better in the light of this. How to manage 'attention' better.

Perhaps we cannot direct our own conscious attention except wherever our unconscious tells us we must, but we can be told where to direct conscious attention by other people or by the structure of a situation. Teachers can, in other words, switch students' consciousness in or out of particular situations; demand that attention be applied in this way or in that. We are so eager to 'explain' everything! So keen to show how! In some educational situations we specifically build in a requirement to invoke consciousness during the learning of such 'explanations', or to a meaningless 'structure', to direct consciousness at the assimilation of detail or convention and, perforce, away from seeking meaning.

When we do this, we make such direction and application of conscious attention a part of the method, we make it part of the learning itself. In the course of such learning, and as part of it, we learn that we must apply conscious attention to such items and in such ways whenever they appear and we will tend to do this ever after.

In other words the direction of conscious attention can become a fixed part of performance as well as of learning. It may take years to recover; to bring performance back under purely unconscious control where it may belong. This may, indeed, never happen (e.g. 'i before e is no help to me' and see notes to chapter five).

My own analysis, in part subjective and in part derived from all the above, is as follows:

Our unconscious knows all about the management of detailed data. It's what it does all day. It exists in a sea of details – data washes unceasingly in from the world outside and continually back and to among its own banks and modules. Items of 'information' are mere details to be categorised, correlated and catalogued, so long as we have a framework of meaning within which they may be thus filed. This assimilation and management of data is a very easy and natural act for the unconscious, given a meaningful framework. Its strength is catching, categorizing, correlating and filing facts within meaning. We should not render this level of learning, data management, unnecessarily cerebral. What conscious mind finds it more natural to grapple with is perhaps the comprehension of broader ideas in meaningful patterns; conscious thought may be necessary for the understanding of conceptual structures and interrelations – the patterns and frameworks upon which and within which mere facts are very simply settled by the unconscious.

Consciousness could be a mechanism allowing the unconscious to obtain an overall, contextualised view, perhaps a second opinion? Perhaps the unconscious deploys consciousness in order to reflect upon stuff? Maybe it uses its conscious partner to correlate minor concepts into broader patterns, into wider meanings? Maybe it's just an amplification system?

It seems to me that we do not naturally and readily learn 'facts' through intellectualisation; we absorb them best directly and unconsciously, and we should humbly remember that nobody really knows how this is done. We learn factual detail most simply and painlessly within an appropriate conceptual framework – in other words with appropriate meta-cognitive understanding. Intellectualising is something we most naturally do around the meta-cognitive understanding of learning itself, not in association with the objects of it. The acquisition of 'facts' is, it seems to me, a natural and simple unconscious act once meta-cognitive structure is understood.

The natural forte, I suggest, of our remarkable unconscious is probably the categorising, correlating and filing of data. We can, though, decide additionally to switch consciousness in (or we can have this decided for us). We can oblige students

deliberately to involve conscious thought in the learning of data or meaningless conventions. We can, when we teach such, also teach that the consciousness switch must be ON, and conscious thinking deliberately invoked. Focussing conscious attention on the minutiae of the data or on meaningless conventions when learning them (the 'i before e' rule, perhaps, or those intimidating homophones) tends also to focus it on them whenever they are subsequently performed. It is as if the 'consciousness ON' switch is forever built into the circuitry relating to that data or convention. Hence my inability simply to spell i and e after c, unconsciously, as I spell practically every other common pattern, without 'thought'. Having been so rigorously taught to bring my conscious to bear on this one spelling convention, I am no longer able to do it solely unconsciously – as I do, more comfortably, with all other spelling patterns I meet.

We could, instead, leave the switch OFF and the conscious mind in peace when learning detail or convention. Maybe we should leave the decision to the unconscious as far as is possible? Maybe we do this best by focussing conscious attention upon the aspects of the situation it feels most comfortable with – the natural, the meaningful and the interesting.

All of this has fundamental implications for the choice of educational method. In which circumstances will we invoke conscious endeavour, and in which situations will we not? Which methods do this and which do not? To return to our educational examples:

A more appropriate way to learn conversational English would be quite other than that I caricatured earlier. Foreign students today learn to use English grammatically without being required to think (consciously!) about grammar, or to 'know' it – exactly as native speaking toddlers do.

I 'know' remarkably little English grammar, how much do you?

A modern conversational language course presents the language in grammatically ordered steps, of course, and at one level grammar is indeed taught, but it is taught covertly and enters only the unconscious mind, probably as a pattern. A session might, for example, be built around the present continuous tense, but the students are kept happily ignorant of this, and the fact that there is another form of our present tense (as are most English speakers, consciously). The students' conscious minds are directed elsewhere, by the learning framework itself.

In the students' consciousness the course consists of intensive practice of situated English with the emphasis on method, fluency, intonation, idiom and vocabulary – the metalinguistic essentials which the students knows and understands. The social settings

we are all used to. Consciousness will hover around method and participation, listening and speaking. Around the game of using language in realistic situations. No grammatical rules will be enunciated or considered. Students will simply learn, rapidly and painlessly, how the present continuous tense feels, or 'tastes' in English. Exactly as toddlers do.

Returning to literacy and the example of the three homophones (*there*, *they're* and *their*):

Rather than direct attention at homophones, let us focus consciousness onto material which can be understood; in which there is clear pattern or transparent structure. Better, for example, to abjure all reference to homophones and such attributes which are not only slight but also conventional or random rather than real. Better, for instance, to learn only one of the words 'there, their, they're' at a time and to direct consciousness to fulfilling understood method and to the pattern itself, which just is.

In this situation, for example, I would teach 'there' with 'here' and 'where' as the 'aitch-ee-ar-ee' pattern by the Look, Cover, Write, Check & Simultaneous Oral Spelling methods (Kirk 1983). Attention is focussed on driving the method, on learning as meta-cognition.

On a totally different occasion I would teach 'their' as a stand-alone (who needs to spell 'heir'?) with its meaning emphasised.

On another completely different occasion I would teach 'they're' when I was teaching the use of the apostrophe, along with other words using the apostrophe.

Conscious attention is hereby focused onto inherently meaningful things - authentic spelling patterns, structured methods, meaning-bearing linguistic constructions – against which the spellings themselves are just examples, learned without comment or conscious attention. There is minimal intellectualising around these spellings. No 'clarifications' or 'explanations', no 'rules' to remember. In this instance, for example, I would absolutely eschew any mention of homophones or any other such peripheral, unreal, irrelevant, confusing, intimidating, unmemorable and pointless 'facts'.

The spelling of more complex, compound words, or words spelled according to an unusual, historical derivation, may be learned through meta-linguistics - considering derivations, roots, relations and so on. This is, though, not to consciously consider the item or its constituent parts. They are almost incidentally learned as mere exemplars, relatively trivial details, while consciousness is occupied deploying meta-linguistic analysis; thinking about the language and how it has developed, how words come to be

constructed, thinking about roots and relationships and how to explore these, and thinking about all this thinking and how interesting it is.

It is worth quoting extensively, here, from the intimidatingly titled 'Effective teachers of literacy' (Medwell *et al* 1998). They say that:

'Technical aspects of literacy ... tended to be approached in quite different ways by the effective teachers ...' (p. 77) and 'The key difference in approach was in the effective teachers' emphasis on embedding attention to word and sentence level aspects of reading and writing within whole text activities which were both meaningful and explained to pupils.' (p. 77) and '... skills were developed ... with a clear eye to ... awareness of their importance and function.' (p. 77) and '... teaching of language features was contextualised ... and the children understood the purpose of this teaching.' (p. 78) and 'Language features were taught and explained ... as a means of managing shared text rather than as a set of rules or definitions to be learnt for their own sakes.' (p. 78) and [effective teachers] '... foregrounded the creation and recreation of meaning ... they tried, wherever possible, to embed their teaching of the crucial technical features of literacy (how to do it) in a context where the children could see why they were learning about such features.' (p. 80)

Finally, the authors say that their 'most significant finding' was precisely that 'effective teachers of literacy' used this 'functionalist approach'. (p. 85) I think these wonderful teachers are, possibly without (consciously!) knowing it, pinpointing the appropriate direction of conscious attention towards meaning in all possible circumstances.

The mind of the child seems to have little problem with data. If pattern, point and purpose can be understood, if meaning is clear, then mere facts appear to slot in without difficulty or pain. Effective teachers make the meta-cognition and meta-linguistics clear, directing consciousness at these aspects of the process. The rest they allow to follow naturally and effortlessly - and unconsciously.

Chapter seven notes.

Exploded text.

Most skills are learned by people rather than being taught to them. Good teaching is 'merely' the provision of environments, both intellectual and affective, in which learning is maximally attractive and likely. This applies particularly to the learning of writing. Good writing is a non-derivative expression of free thought. Good writing is free and autonomous, individual and personal. The aim of tuition is good writing. This may entail not much more than setting out in metacognitively aware pursuit of the right goals. These include personal autonomy and the confident, free ownership of language; the confidence to have a go and the skills of surviving, and making good, imperfection; how to consider, criticise and correct writing; the properly enthusiastic use of the waste paper basket.

There is only one way autonomously to improve writing. It's simply what we all do, in real life, all the time. Mindful, though, of the importance of metacognition, we must openly formalise and teach the procedures and also the need to use them when we write. In the first instance it is crucial to redress the Matthew effect. ABE students who want to learn to write must do so in quantity. An ABE student (any student!) needs the practice. The resulting writing will be the basis for learning how to self-correct and how to improve, using the language experience method.

The skills in good writing range from the meta to the micro, from the assembly and display of wise, worldly and witty thoughts to the careful consideration of commas. It is, of course, impossible to teach this as a 'subject'. It is only possible to learn how to write by doing some writing and then critically but positively examining the outcome. This is the *language experience* method, yet again.

I use a method which I call 'exploded text' in order to formalise the processes inherent in this particular application of the general language experience approach; to make it more precisely metacognitively clear exactly what the method entails.

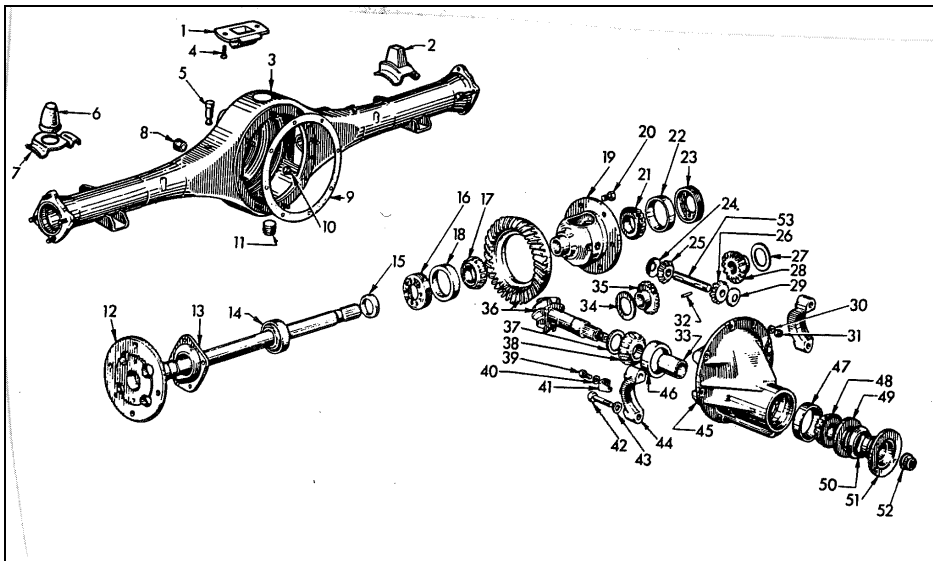


Figure 11.1 Rear axle: component parts

The above diagram is what an engineer calls an exploded view of a mechanism. All the bits are, in imagination, blown apart and then drawn. The viewer can, as a result, see very easily and clearly what each bit looks like, where it goes and what it does – what it is and where it fits in the greater scheme of things. What is sauce for engineers may be sauce also for educators. If we ‘explode’ a piece of writing both its general form and all its specific details become much more clearly visible.

Text (students’ writing) is ‘exploded’ between full stops. In early stages, with a student at beginner level, it may help a student to see the point if his writing is physically cut apart at full stops and photocopied with gaps between each ‘sentence’. At the very least every full stop should be greatly exaggerated – highlighted perhaps. Somehow, at any rate, each ‘sentence’ is made very independently visible, very easy to consider in isolation from all others. Each ‘sentence’ is then considered from secretarial and authorial points of view. We ask questions of it in both modes. The aim is to get the student to understand how to do this self-correction autonomously, and routinely to do it, just as we do all the time.

I wish you luck, incidentally, explaining just what a sentence actually is. The Shorter Oxford English Dictionary from 1993 gives, among a lot of other stuff: ‘A series of words complete in itself as a thought, containing or implying a subject and predicate and

conveying a statement, question, exclamation or command' and (throwing in the towel altogether) 'A piece of writing between two full stops' and (musical, but helps) 'A complete idea ...'.

We have dealt with considering our own writing as a secretary but we must first examine it as its author. Separating these two aspects of writing greatly simplifies the process of self-correction for students. Our questions asked of the writing will be different in each case. This fundamental approach must, as always, be made metacognitively clear to the student.

As secretary we ask questions like: do the spellings look right? Does the punctuation fit the way it reads? These need to be answered, of course, as students are only too well aware, but punctuation and spelling are not writing. There is no soul or excitement in them. No joy. They are essential to learning literacy, and helpful to the reader, but do not move or motivate. Students need to be enthused about writing and they need, therefore, to be very specifically taught about the many skills of authors – which is what they are, of course, whenever they write.

As author we read our sentence (preferably aloud, to catch and consider its cadences) as many times as is necessary to answer questions asked of it. In author mode we ask such things as: is it really a sentence at all? If not, should it be broken up into two sentences, changed in some way, or perhaps amalgamated, whole or in part, with a neighbouring sentence? Is it too long? (and see appendix five) Does it make sense as it is? If not, why not? Does it read well (sound good)? If not, or perhaps anyway, could it be expressed differently? Would it sound better then? Does it say what was intended (and nothing unintended)? If not, how should it be rephrased? Does it fit with the rest of the piece? Can any fat be cut from it? Is the style attractive – is it me? How will it affect a reader, and is that what I want?

It is usually necessary to read and re-read each sentence aloud really to get the feel of it – and this is what students should know they are doing. They want the feel of it. They want to know how it sounds, and their own judgement on that question should be relied upon. Students who are fluent in English are all capable of assessing their own writing simply by trying to say it aloud and listening to it, just as you do. If it sounds wrong it probably is; if it doesn't it's probably alright (though may still be capable of improvement – all writing is capable of almost endless improvement). Students need confidence if they are to manage this technique – the aim is to get them using it independently after all. They need early success and they must be absolutely clear how the method works, and also that they should deliberately call upon it. They need particularly to be reassured that binning large amounts of the first, and usually second

or even third and fourth attempts is not just usual, it is almost always so desirable as to be best thought of as mandatory. They also need the confidence to stand up for their own decisions as author; if they genuinely wish to say a particular thing in a particular way then that is their choice – it's their language and they may use it as they wish, spell check, spell Czech or spell cheque notwithstanding.

It is far easier to deal with language in sentence-sized chunks. Many skills are learned this way: the skills of organising thought, the skills of critical reading, the skills of sentence recognition and construction, punctuation and how it works, the visual checking of spelling. In short, the ability to examine writing in an autonomous and constructive way. The point is assuredly not to get the student to write like the tutor, but to enable the student to recognise, value and express his own voice to his own satisfaction on his own paper. The object is to demonstrate to the student how he can produce better, clearer, more 'worked', more intentional and directed, more accurate writing containing more of what he wants and less of what he doesn't.

A student should, after all, leave tuition independent, confident and free; self-sufficient not merely at the level attained in 'class' but able, motivated, metalinguistically and metacognitively equipped to develop further alone and autonomously; to provide his own learning environments as and when; in short, to ripen into his own, lifelong monitor, supporter and teacher.

Chapter eight notes.

Dyslexia in ABE: Beliefs and consequences.

*What do adult literacy providers believe about dyslexia,
how do they deal with it and does it matter?*

In 1999 I administered a 39-item, in-depth, postal questionnaire survey (Kerr 1999) to twelve experienced teachers and providers of Adult Basic Education (ABE). The questionnaire explored respondents' attitudes towards, and beliefs about, dyslexia in considerable detail, focussing particularly on their reported educational behaviours in respect of students in ABE who had been diagnosed as 'dyslexic'. All respondents were students on the same M.Ed. (literacy) course as the author; all twelve were employed in the field of adult literacy. Two worked in the prison service, one in workplace literacy, six within FE colleges, two had recently moved into ABE management from the chalkface, one was a volunteer ABE tutor in Washington. Their responses to this questionnaire were analysed horizontally (between respondents) and vertically (within respondents). Analysis was almost entirely qualitative and theory was grounded, arising from the data itself and from its analysis. (Denzin & Lincoln 1994, Silverman 1993)

There is considerable research exploring teachers' belief systems and attitudes. Much of this research confirms the important effects these have upon teachers' behaviours, philosophies and even their effectiveness. (Agne *et al* 1994, Bar-Tal 1984, Chan 1994, Chan 1996, Dirkx & Spurgin 1992, Fang 1996, Muthukrishna & Borkowski 1995, Ross & Smith 1990, Schumm *et al* 1994, Westwood 1995, Westwood *et al* 1997)

I was, however, unable to find previous research exploring the specific question whether, and how, teachers and providers in ABE might be affected, theoretically or practically, when faced with a student diagnosed as 'dyslexic'. Although this research rests on a relatively small sample and a single, though searching, survey tool it appears to be the first of its kind and particular interest is therefore claimed for its findings, though clearly such a preliminary study can only be suggestive and exploratory.

Findings:

I intended 'dyslexia' to mean developmental dyslexia, in other words a difficulty in acquiring or managing literacy skills which is caused by an innate neurological deficit of some kind. Responses indicated that respondents all concurred with this definition, in particular that dyslexia would entail an unspecified but innate neurological deficit.

The survey appeared clearly to reveal two broad findings. First, and very striking, was the high degree of variance of opinion and attitude among respondents in respect of dyslexia. Responses revealed almost universal, and very considerable, confusion and uncertainty as to what dyslexia might be, what might indicate it, what might cause it, what to do about it and even whether it existed at all. The level of confidence in relation to 'the facts' about dyslexia was low. This uncertainty was almost universally overtly recognised by respondents themselves, most of whom were apparently very much concerned by it.

Confusion was found between, but also within, respondents, many of whom revealed internal inconsistencies in respect of dyslexia, these inconsistencies also often overtly recognised and remarked upon. Six respondents (50%) were unsure whether dyslexia was a real syndrome or not; 25% of respondents were firmly persuaded that it was a genuine condition while a further 25% were equally firmly persuaded that it was not; they stated clearly that, in their opinion, dyslexia did not exist. Respondents' estimates of the prevalence of dyslexia varied from 0% (from an unpersuaded respondent) to over 25% (from a persuaded respondent working in the prison service). 42% of respondents reported a gender difference in prevalence (generally 3:1 male:female) though 25% specifically reported that they found no such gender bias.

All respondents reported that they were obliged to deal professionally with students diagnosed as 'dyslexic'.

How dyslexia might be diagnosed, or suspected, was unclear. One respondent, for example, claimed six times as many indicators were diagnostic of dyslexia, from a list provided, as did another respondent. Oddly, at a time when 'the gene for dyslexia' was being noisily discovered yet again, only one in three respondents claimed a family history of literacy difficulty might lead to suspicion of dyslexia. Far and away the most

commonly chosen indicators of possible dyslexia were the pre-fluency conditions of tending to produce poor or peculiar spellings or reversals and inversions (75%), as well as the IQ/achievement criterion (92%). Only two other indicator signs (difficulty pronouncing polysyllabic words and poor memory) were selected by over half the respondents. Only one respondent chose a history of hyperactivity as suggestive of increased risk of dyslexia (*cf.* the situation in North America) and only two a history of behavioural problems.

Asked to define dyslexia, only one coherent definition emerged (though attributing causation to two distinct cognitive domains) and 50% of respondents claimed to be unable even to attempt a definition and did not do so. There was a considerable tendency to use the term 'dyslexia' extremely loosely, often simply as shorthand to mean difficulty of any kind with literacy. Many respondents appeared to accept extraordinarily various definitions, possible causations, likely effects and indicators of dyslexia. Interestingly, the more persuaded respondents accepted very much greater variability in all of these, while still considering dyslexia to be a discrete neurological syndrome, than did less persuaded respondents.

50% of respondents considered dyslexia when assessing ABE students though only 17% routinely screened for it. Four responses claimed that the effect of a diagnosis on a student would be positive, while two responses stated that the diagnosis could be harmful. (These two respondents had clearly seen the potential for learned helplessness in a diagnosis.)

Almost every respondent (92%) selected the IQ/achievement discrepancy criterion as most indicative of dyslexia, though only 25% of respondents elsewhere said they regarded IQ tests as either useful or reliable and only one respondent actually employed them. Two thirds of respondents mentioned affect as a likely alternative explanation for a difficulty with literacy. Only one third of respondents selected a family history of literacy difficulty as indicative of dyslexia. Three quarters of respondents selected the pre-fluency indicators of odd spelling patterns and a tendency to produce reversals or inversions as indicative of dyslexia.

The second broad finding, and perhaps that which is most immediately practically significant, was that at least two thirds of respondents showed considerable disempowerment, or *learned helplessness*, when faced with a student diagnosed as

'dyslexic'. In such a circumstance the language used by two thirds of respondents grew grey and pessimistic, expectations fell precipitately and tuition became abruptly behaviourist, skill and drill-based and sometimes scheme-driven (eg Hornsby & Shear 1980 was suddenly put to use). Five respondents (42%) claimed that they did not alter their tuition in the face of a diagnosis – three of these were unpersuaded. Notwithstanding this self-report four of these respondents indicated, elsewhere in their testimony, that they did in fact offer somewhat reduced tuition to 'dyslexic' students. Six respondents (50%) overtly reported that their tuition was altered for a 'dyslexic' student.

Wherever tuition was altered this was invariably a 'dumbing down'. Flair and methodological freedom frequently vanished. What respondents appeared to offer 'dyslexics' was fragmented and deliberately repetitive, highly structured and controlled, depersonalised and focussed on the sub-skills of literacy.

A majority of respondents appeared to believe that for a 'dyslexic' the learning of literacy is so formidable and arduous a task that real victory is improbable. This relative hopelessness was, in many instances, sympathetically but nonetheless clearly transmitted to the student in question. Expectations fell dramatically, and almost universally, in respect of 'dyslexic' students.

Only two respondents (17%) (one fully persuaded of the reality of dyslexia, one absolutely unpersuaded) claimed confidently to expect real progress from a 'dyslexic', leading to independent use of literacy in the real world.

Respondents generally wrote that progress, for a 'dyslexic', would be difficult and uncertain; that it would inevitably take much longer and that there would be a greater tendency to regress. Progress, these respondents wrote, would be insecure and the eventual autonomous use of literacy elsewhere than in the classroom would be unlikely. Many respondents gave extremely bleak prognoses.

Conclusions:

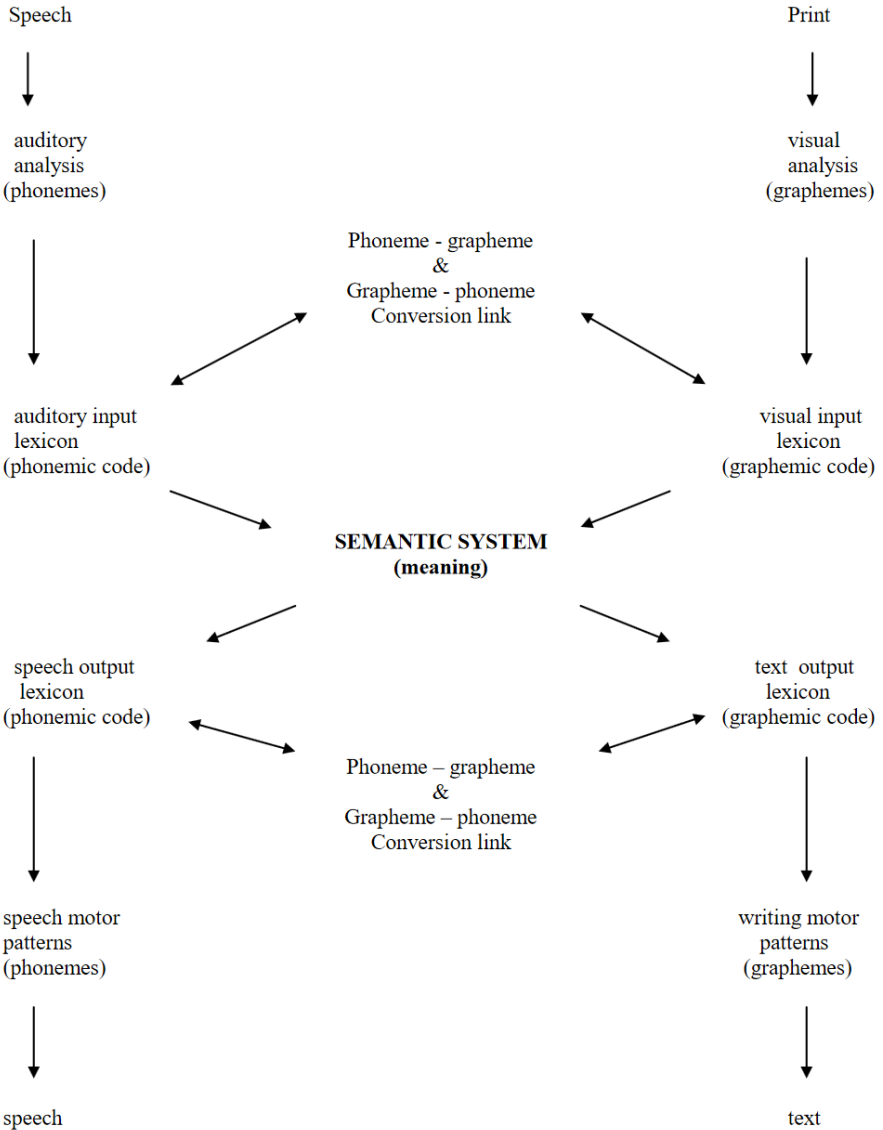
This survey appears to indicate that simply giving a particular student a particular diagnosis may, subtly but forcefully, affect his teacher. This general effect of preconception on attitude, belief and performance is, in fact, repeatedly confirmed through a long line of research beginning with the now infamous 'Pygmalion in the Classroom' (Rosenthal & Jacobson 1968). Clearly, preconceptions matter.

A diagnosis of 'dyslexia' appears to exert very considerable power, and by no means only over the person diagnosed. It appears profoundly to affect the expectations and behaviours of experienced ABE providers, many of whom do not accept and most of whom do not believe they understand, the syndrome. It appears, notwithstanding, instantly to induce learned helplessness in them. It appears to do this entirely unconsciously - not a single respondent remarked upon the abrupt change in their own attitude and performance following knowledge of a diagnosis.

That a diagnosis of it will instantly induce learned helplessness all round is a very peculiar allegation to make about a syndrome which may not even exist.

Appendix one

Cognitive map of language management.



Appendix two

Spellism

Some people find it hard to spell
While others do it very well.
The latter can be very quick
To criticise; they get a kick
From knowing how to spell a word
Of which most people haven't heard.

They like to think this proves they're clever,
Although they practically never
Stop to think if this is true
Or not. I recommend that you
And I should give some thought
To what it means to spell; we ought
To look at history - this will tell
That William Shakespeare couldn't spell
For peanuts, and his royal queen
(H.R.H. Liz one, I mean)
Was twice as bad. One can tell at a
Glance, though, that *it didn't matter!*

Dr Johnson hadn't yet
Thrown his stiff, pedantic net
Over the language; he had not
Invented standard spelling - what
You wrote was what you thought looked best;
You simply *wrote* and left the rest.

You left the reading to the reader
Who, at this time, didn't need a
Massive dictionary. (Which was
As well, you understand, because
There wasn't one as yet.) You see

A writer, way back then, was free
To spell exactly how he liked.
His writing had not yet been spiked
By the debilitating fear
That folk might giggle, sniff or sneer
At what he'd written - for no better
Reason than they thought his letter
Patterns were a little odd
Compared to those laid down by God
(Or was it Dr Johnson) for
A standard spelling, evermore.
A "spellist" age we live in now,
Where you are often judged by how
You spell *liaise* or *guarantee*,
People or *Arachnidae*.

It's very easy to admit
You have more than a little bit
Of problem with your maths, and yet
There is no way that you would let
The knowledge that your spelling's bad
Get out at any price.

It's sad
To say this, but we know
That spelling well just doesn't show
Intelligence, for any fool
Can learn to spell in infant school -
Given the chance.

For reasons why
Some don't achieve this we should try
Examining the wider picture,
Which would make our theory richer.

As well as this, though, we should learn
How negative it is to spurn
A person (just as though he smells)
Simply because of how he spells.

Spelling is spelling, nothing more.
It isn't "authorship" and nor
Does it equate to writing; it
Isn't wisdom, truth or wit.

It is an unimportant skill,
A simple, boring memory drill;
Nothing to do, as you can see,
With art, or creativity.

Writing that's beautiful, or true,
Has its influence on you
Not, for heaven's sake, because
Of how the bloody *spelling* was!

Appendix three

Oh Know it won't!

Who needs to spell? **Spell Check** will do it all for us won't it?

Well no, it won't.

I have analysed some writing from a (Welsh-speaking) basic skills student. Over a period of 3 months the proportion of the errors he makes which would be detected by Spell Check averages at just over 50%. This is underwhelming.

Some errors Spell Check won't spot are simply slips of the mind ("make" for "making"), some are slips of the fist ("our" for "or"), some are slips of the ear ("will" for "well") and some are gaps in knowledge ("fort" for "fought"). Some of this student's errors are importations of Welsh phonetics ("main" for "mine", "life music" for "Live music").

Technology is grate but we ought two keep it in perspective. Students need too now its limitations. Confidence (witch is what we are about) comes form owning an ability, not a machine.

'Word' tells me that all of the above is fine. This leaves me confident, but still wrong!

Appendix four

Roofs: ar thay enny uce?

Apart from seldom working well
Rules are boring, dull as hell.
They are so dull you can't recall
More than one or two at all.
Maybe spelling should be taught
With very little conscious thought.
It may be simpler than it seems
To do the job by other means.
Instead of teaching rules let's tell
Students just to learn to spell.

Teaching a spelling by a rule
Can make you look a perfect fool.
You find a rule you think will do it
But zillions of exceptions to it
Turn up at once – spelled different ways –
Leaving your student in a daze
And unconvinced. Perhaps it's better
Just to learn the English letter
Patterns as they come along;
Thinking about them feels all wrong.

Rules get in the way it is easy to see
("I before E" is no help to me!).
They stop you from writing without any thought
For your spelling. We certainly ought
To refrain, if we can, from temptations to teach
Any method implying a student should reach
For his consciousness, therein to paddle around
In worrying mystery until he has found
A Heath-Robinson set of instructions which may
(Or may well, indeed not) assist him to say
What he's probably, by now, forgotten again
And which may, therefore, never arrive at his pen.

Let us teach to the patterns of unconsciousness
(maybe using L.C.W.C./S.O.S.
Via “language experience”) – give thinking a break;
Thinking too much is a basic mistake!

Appendix five

Size matters.

Whenever you write you should keep this in mind –
Really clear language is quite hard to find.
So as you are writing you certainly ought
To attempt to control it by keeping it short.

It's rather like football. As you know then,
If you hold the ball close all those horrible men
Wearing different shirts cannot take it away
And you have some control over whatever may
Or may not happen next.
It's a matter of reach.
And this is exactly what I'd like to teach
With this doggerel; that it is usually wrong

just to keep writing and writing, inserting clauses & commas,
each one, rather than adding to meaning, tending to distract from it
until,
should any of the readers who started with you still be reading at all,
even the most patient, persistent, and generous of them
is likely,
from linguistic exhaustion if nothing else,
to reach the deplorable conclusion that
although the subject seemed to be most interesting a while ago
it has become, over the course of very recent time,
suddenly and unaccountably
much less fascinating than they at first imagined –
although they may not realise that this is simply because you,
the writer of all this,
have committed that most basic of writers' errors
which is

To let all your sentences get far too long!

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