It is inquisitiveness that best defines what we humans are all about. We ask endless questions, the answers to which often beg still further questions. From the darting, curious, eyes of a baby only a few weeks old, to the growing child’s persistent questioning of ‘tell me why/what/when/where/how/who’ we embark on a life time’s search to make sense of ourselves and the world around us. It’s curiosity that drives brain growth.

It’s more important to ask good questions than it is to ‘know’ the right answers. The better the question the more likely it is that the individual is close to finding out the answer for himself. Good parents sense this, and good teachers know when instruction needs to stop so that the child, by finally working out how all the pieces come together, experiences the excitement of discovery - the ‘eureka’ moment. At whatever age, we all learn best when we have ample opportunity to work things out for ourselves, however tentative our initial conclusions may be. Einstein understood this tension between learning and teaching when he expressed the fear that modern methods of instruction might ‘strangle the holy curiosity of enquiry, for this delicate little plant, aside from stimulation, stands mainly in need of freedom.’

It is through asking our own questions that we construct knowledge, and we do this best when we are able to meander - or to browse; to set off with a general goal but with plenty of opportunity to stop on the way, and to explore alternative routes. A romantic dream? Not really. It’s the way our brains work for, until no more than seven or eight generations back, that was exactly how all our ancestors from the beginning of time had lived. It was the speed of walking, some two or three miles an hour, that set both the pace and the way in which we learn. We rarely go in a straight line, we rarely focus on a single topic, and we are always looking to see what new opportunities may be around the next corner. One question always stimulates another.

We don’t become knowledgeable simply on our own, but mainly through close interaction with other people. We certainly don’t seek the isolation of the sea eagle. Neither for us the army mentality of the ant, nor the herd mentality of the buffalo, nor even the flocking of the swallows. It is our brains that give us our ability to communicate and share abstract ideas, and in so doing we have learnt how to create community. We have evolved complex family and social structures which balance male and female skills in ways which give us an enhanced capability to bring up our offspring. Left to our
own devices we self-organize within small groups to achieve what an individual alone could never do. We endlessly imitate people we respect. We seek out and relish help from others in solving immediate and long-term problems.

With all this recent knowledge about our brains, we are only just now able to draw these pieces together and to see our species for what it really is - Ice Age hunters only partially evolved towards being intelligent; a clever species which has constantly to struggle to become wise enough for its own good. Think how our less-evolved ancestors of half a million years ago would envy us the ability that is now in our brains! And yet, we have the opportunity to be clever only because of what the experience of our countless ancestors has bequeathed to us through the structures of the human brain.

It’s why asking questions is so very important, for with every technological breakthrough the social status is further thrown into the melting pot. Change becomes the constant. “In times of change learners inherit the earth while the learned find themselves beautifully equipped for a world that no longer exists”². To survive we have to be inquisitive, and we have to act collaboratively. It has been said that we start life as a question mark; if we cease being inquisitive, our lives end as full stops.
Learning is not so much about being taught, as it is the consequence of having to think something out for yourself. As such, learning is a reflective activity. By drawing upon our past experiences to understand and evaluate new ideas we are able to shape future actions and formulate new concepts. Learning is not only complex, but messy, frequently intuitive and very rarely simply linear or logical.

The process of learning is as old as life itself. It has passed from simple self-organisation to a collaborative, social, problem-solving activity much dependent on talk, practical involvement and experimentation. Formal schooling – dependent as it is on instruction which is based around simulated reality – is so recent, (five or six generations in most cases) that it is unlikely to have changed or modified any of our inherited predispositions to learn in the ways that our ancient ancestors found so useful.

The brain takes most seriously those things that matter to its own well-being. Our brains are old hands at dealing with information over-load. The brain is primed to notice any information that might have a ‘life or death’ significance, and instantly our entire nervous system goes into the highest state of alertness. We act involuntarily. Later you may recall such an experience as if, for that split second, time seemed to stand so still that you were able to work out carefully exactly what you had to do to save yourself. For most of the time, however, the brain is simply able to discard most of the million or so bits of information it receives every second as worthless. A tiny fraction of that information the brain may well file away according to one’s own particular preferences; a young football fan will remember every detail of that Saturday’s football fixtures, but nothing of the rest of the news, and his mind will be a complete blank as far as his chemistry homework is concerned.

Learning is, for the brain, what strong vigorous exercise is to the athlete – it strengthens the brain’s neural networks, and makes cognitive processes far more effective. The broader and more diverse the experiences when very young, the greater are the chances that, later in life, the individual will be able to handle open, ambiguous, uncertain and novel situations. The ‘culture’ that a baby observes in the conversations of adults helps the developing child to shape the pattern of mental connections, or synapses, between different nerve cells in its own brain. Those nerve cells that are active, or fire, simultaneously (such as when engaging in a task) are more likely to fire together in the future (the basis of learning and memory). Babies have the structures for this present at birth, but need a range of stimuli to help mould and perfect the finished prod-
ucts.

Good as they are, our natural pre-dispositions to learn are no longer adequate to the needs of our present world; ways have to be found of extending our natural abilities so that they go ‘beyond what comes naturally’. This is the central issue that faces educationalists everywhere. It is called metacognition; the ability to think about your own thinking, so as to develop skills that are genuinely transferable and not tied to a single body of knowledge so they can be applied in different settings. In a world of continuous change it is this reflective intelligence that becomes ever more important – the ability to ‘think’ yourself around a problem.

It has been on the restless, creative energy of each new generation that society has been dependent for its progress, and for the solution to problems that earlier generations had thought intractable. What is needed now, more than ever before, is ‘nous’; or gumption, in other words, good old-fashioned common sense. These are the reflective capacities that help unseat old assumptions, and set out new possibilities. These are the essential abilities necessary to face a world of change.

Learning is an immensely complex business that educationalists seek to simplify and codify at society’s peril. To put faith in a highly directive, prescriptive curriculum is to so ‘go against the grain of the brain’, that it will inhibit creativity and enterprise… the very skills needed in the complex, diversity of society for which we need to prepare our children.
Humans Love to talk. It’s conversation that helps the youngest brains to grow, and the oldest brains to remain agile. The more we talk the larger becomes our vocabulary (the average Englishman has a vocabulary of some seventy-five thousand words). As an intensely social and inquisitive species, dependent upon each other for survival, this sharing of ideas – about ourselves, about other people, about events past and possible events to come – is the very stuff of our humanity. 

It seems that we humans were capable of quite specific communication long before we could speak. We used gestures. Babies first hold out their hands when they want something, and expect to see something of interest if they look towards the direction someone else is pointing. Speech and hand movements are controlled by the same motor region in the brain, and research with chimpanzees (who have only a 1.6% difference in their DNA to ourselves) show that they have an elaborate range of ‘gestural’ language, and can be taught the rudiments of sign language. Through our deep-seated empathetic skills it’s most likely that our ancient ancestors combined gesture with sophisticated appreciation of facial characteristics – it’s not just the continental who communicate with words, signs and grimaces – we all do!

Some one hundred and fifty thousand years ago it seems that we humans had been standing on our back legs for long enough for the head to naturally sit further back on the spine so making our eyes better positioned to look forward. This slightly lengthened our throats (push your head backwards a little and see how this works) which in turn lengthened and slightly depressed the larynx – the voice box – so making it possible for us to control our breathing whilst talking at the same time (quite a feat). Some scientists have recently suggested that the advent of speech was made easier by the increasing diversity in the human diet, possibly due to the fact that our ancestors, who tended then to live either on the banks of rivers or close to the sea, had become sufficiently good at fishing that they were able to increase their supply of those extra fatty acids (EFAs) only to be found in fish. Such EFAs create better neural sheathing which, quite literally, stops brain signals from leaking. To cut a long story short, humans from then on have just never stopped talking. It’s not simply that we like listening to our own voices, but we are intrigued about everything we can learn from each other. With language, brain
growth went into overdrive.

Any child born anywhere has the innate ability to make some sixty structured sounds, or phonemes, out of which every letter in every one of the six thousand or so extant languages are formed. Young children endlessly imitate the language they hear around them. By 18 months, the young baby surrounded by plenty of conversation is adding new words to their vocabulary at the rate of one every two hours; by thirty months the baby is learning a prodigious thirty new words a day... all without any explicit instruction or the threat of a homework test. Even more amazingly the child is putting those words into a meaningful sequence in joined-up sentences.

In the development of language the home environment in the first two or three years is of critical importance. The more language heard, and the more the child participates in conversation, the more confident the child becomes in extending its vocabulary. Research by the Kellogg Foundation in the state of Michigan into what were the greatest predictors of success at the age of 18 found that the most significant factor, four times more than any other factors, was the quantity and quality of dialogue in the child’s home before the fifth birthday. Families that talk a lot tend to produce the liveliest children.

Men and women have different talking strategies. Both sexes formulate the same number of words in a day - averaging 8,000; men only articulate about a third of these, whereas many women can effortlessly give voice to every formulated thought. This appears to have its origins deep in the ancestral environment when women always had someone to talk to as they reared the children whereas men for much of the time were alone as they hunted. Women use many words to get a variety of meanings, men use longer but fewer words to convey similar meanings. Everyone knows that men stubbornly refuse to ask the way! Studies show that women have a different (neither inferior nor superior) way of locating themselves in space which is more to do with their relationship to prominent objects, and less to do with abstract measurements of distance and direction. Women often feel happy asking for help find the way, whilst at the same time venting some of their daily dose of words! Men, when lost, keep quiet, and blame the map!

Language enables us to learn from each other, we find out how and why things need to be done. Even when fully on-task, it seems we can all be tempted and fascinated by a bit of scandalous gossip!
As our distant ancestors started to make better use of their brains so, over long periods of time, human brains got larger so forcing the skull to get bigger. So large did the skull become that the birthing process became more difficult and more problematic for humans than any other mammal. To ease the process humans give birth to their young when their brains are still tiny - a mere forty percent of their full structural form.

How is it, then, that if we have such premature brains we go on to become the planet’s pre-eminent learning species? Evolution has turned what seems to be a horrible disadvantage into a massive benefit, and in so doing created the conditions that have resulted in thinking, talking, contriving, thrusting and argumentative Modern Man. It goes like this. Mammals whose young develop almost exclusively within the mother’s womb are born equipped with all the instincts they need to survive - there is little they need to learn. Because humans developed empathetic skills (the understanding of a neighbour’s thoughts and intensions through our ability to “read their faces”) maybe as long ago as one and a half million years they needed brains large enough to hold vast quantities of data.

With the advent of spoken language in the last one hundred fifty thousand years, the skull has again expanded. Being born only nine months after conception (rather than the twenty-seven months which is the theoretical time it would take for the brain to reach maturity within the womb) human babies are infinitely more dependent on cultural interaction outside the womb to stimulate subsequent brain growth than are those mammals whose brains are pre-eminently shaped by instincts before birth.

Being born so premature means that human babies are extraordinarily vulnerable, which has put pressure on mothers-to-be to find mates who will stick around long enough to help succour the young - the evolutionary basis for the family unit. (Research in 2005 suggests that the time it takes for a woman to reach orgasm is an evolutionary adaptation that enables the woman to assess whether the man is interested enough in her to trust him as a long-term provider. More than any other creature culture becomes very important to humans. Babies can learn more experientially outside the womb than other mammals can ever inherit as instincts. Because cultures change far more rapidly than does human nature, our babies, if they live in a reasonably interactive culture, will acquire a massive “learning advantage” over their nearest animal relatives - the chimpanzees - in the first
three years of life.

Consider the eyes of that young baby as it follows your every move. 
“What's going on in there?” you wonder*. And well you should, for some seventy or so years later those darting, questioning, eyes may well belong to an Einstein or a Darwin. Now compare that with the lack of contrast between a baby Chimpanzee's eyes, and a grand old grandfather of a chimpanzee. Something amazing is going on inside the human brain that is not there amongst our nearest relatives.

In those very few 'Romulus and Remus*' situations where human babies have been brought up by animals (feral children) such children have none of these cultural advantages, and revert to early Stone Age behaviour. Civilisation rests very lightly on top of ancient instincts.

It's all there in our big brains. It is they which give us the mental appearance of being travellers from an antique land. Sometimes it feels as if we're trying to run twenty-first century software on hardware last updated fifty thousand years ago.
Aristotle defined intelligence when he said anyone can become angry – that’s the easy part. But to be angry with the right person, to the right degree, at the right time, for the right reason and in the right way, that is where intelligence becomes so important. Stephen Jay Gould, the evolutionary biologist, ascribes this ability as a survival skill; “We have become, by the power of a glorious evolutionary accident called intelligence, the steward of life’s continuity on earth. We did not ask for this role, but we cannot abjure it. We may not be suited to it, but here we are”\(^1\). So we had better get on and act intelligently!

It was the Frenchman, Alfred Binet, who invented a predictive test to sort out the ‘feeble-minded’ from those who might serve in the army\(^2\). His ideas resulted in the Stanford-Binet intelligence tests which claimed to give an accurate Intelligence Quotient (IQ) to each person by relating their test scores to their chronological age. It soon became clear that individuals tended to increase their IQ scores as they became better educated, while whole populations over time showed a rise in average levels of IQ. This questioned their validity. The tests were of even less value if administered to cross-cultural groups.

It was in Frames of Mind in 1983, that Howard Gardner set out the theory of Multiple Intelligences\(^3\). According to his research, humans are able to make sense of the world through various forms of intelligence: linguistic, logical-mathematical analysis, spatial representation, musical thinking, use of body to solve problems (kinaesthetic), an interpersonal skill and an intraspective intelligence. Later he added, somewhat hesitatingly, an eighth intelligence which he variously called naturalistic or spiritual. Individuals, he noted, differed in the strength of these intelligences leading Gardener to propose that a single definition of intelligence should be replaced by a profile of intelligences.

Others\(^4\) have argued that intelligence as a concept can be defined in three parts. Roughly half of what we call intelligence has a genetic base - some people are born with a Rolls Royce of a brain, others with
a clapped out Morris Minor. About a quarter of intelligent behaviour is content specific - a skilled pneumatic drill operator would make a very bad dentist. However a third component, composing 20-30% of the whole, is described as ‘reflective intelligence’, the ability to think around a problem. If the content’s specific nature of intelligence is likened to a map of country to be traversed, then reflective intelligence is how a good driver of an old car can cover the course more easily than a bad driver of a brand-spanking new Porsche. It is reflective intelligence that responds best to education.

Emotional intelligence seeks to explain why people with high academic but low emotional skills often do less well than those with a profound emotional understanding of people but with less technical knowledge\(^5\). Emotional intelligence includes such characteristics as self awareness and impulse control, persistence, zeal, self-motivation and empathy. The idea of spiritual intelligence\(^6\) draws on recent research into high-frequency (40Hz) neural oscillations which are being used to explore the neural basis of transcendency, the origins of human creativity, moral codes, an ability to temper rigid rules with understanding, and about the formation of meaning, vision and values.

Just as no two people look alike - sexual reproduction and genetic mutations see to that - so no two people think in the same way. Some claim to have particular ‘learning styles’, which makes it easier to work, say, with music in the background. Some find reading a book easy, while others find listening to a lecture hard. Some people have no sense of space or direction, others can not distinguish one musical note from another, and others can’t draw to save their lives.

Intelligence is undoubtedly multi-faceted, for very good reasons. To survive out on the savannah all those tens of thousands of years ago, or to have been a trader in William the Conqueror’s London, or a sailor in the Napoleonic wars, you needed to be able to approach your every-changing environment in every possible way. Maybe part of the mental confusion of our own day is that we don’t have enough opportunities to develop our own various forms of intelligence\(^7\).