B. F. Skinner's Last Interviews

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Mind Warriors

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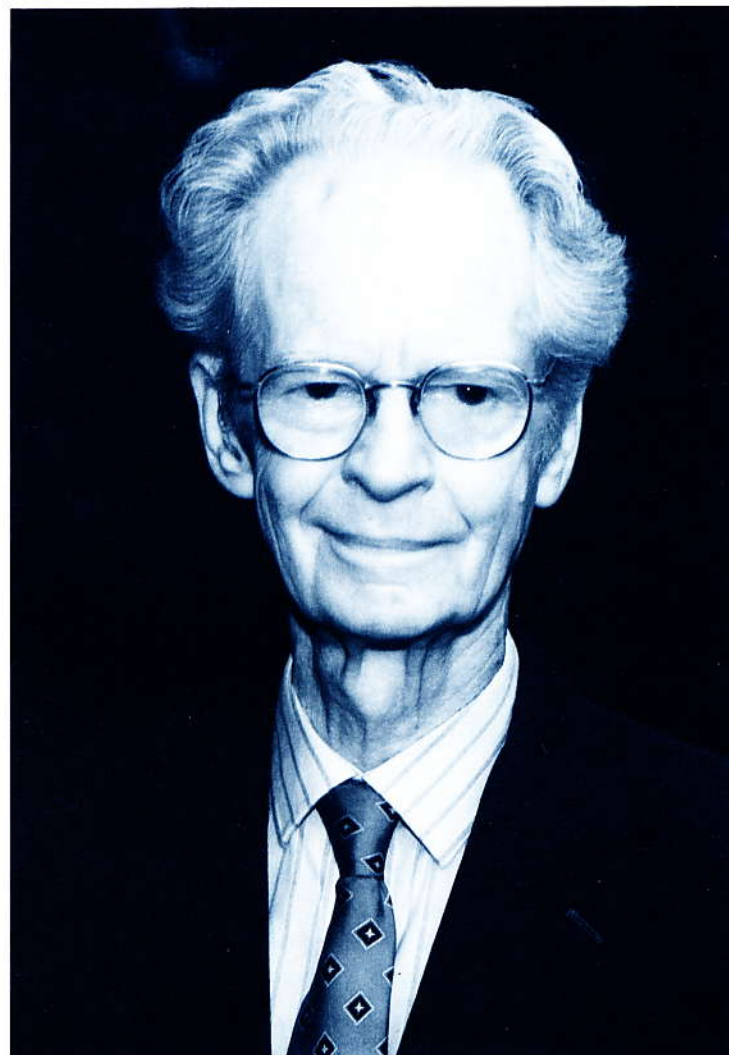
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21st February 1995
Have you checked in
Old Moore's Almanak?

EDITORIAL

MERRY CHRISTMAS *SYNAPSIA* READERS!

With this issue *Synapsia* is honoured to feature one of the last interviews ever given by B.F. Skinner before his recent death on 18 August 1990, from leukemia. B.F. Skinner was the founder of Behaviourism, a major branch of human research which has profoundly affected the thoughts and actions of the twentieth century.

In this issue Professor Skinner talks of his approach to his illness and to life and death, his thoughts on health, study, learning, and thinking, and gives a challenging view on his thoughts about the purpose of The Brain Club.

In future issues Professor Skinner covers a vast range of topics, including love, the creative mind, art, education, children, his own youth, the major influences on his thinking, the nature of work, approaches to ageing, the environment, reward and punishment, and the future of humankind.

Synapsia also welcomes as a new member to The Brain Club David Levy. David is most widely known as the man who challenged all the world's best computers to beat him at chess. In 1986 he started a £1,250 bet with four artificial intelligence professors that no computer programme would win a chess match against him within 10 years. He won this wager, which led to an international challenge against all computer manufacturers and programmers, culminating in a grand match against 'Deep Thought', the most powerful artificial intellect ever created. David was victorious against all challengers for 21 years! In this issue he has kindly contributed an article on Machine and Human Intelligence.

As we go to press, the two Titans of the chess world, Gary Kasparov and Anatoly Karpov, are battling neck-and-neck for the World Championship in Lyon, France. To keep *Synapsia* reader abreast of this epic confrontation, Brain Club member and international Chess Grand Master Raymond Keene, O.B.E. provides an entertaining background to this Championship, and summarises the first 12 games of the match held in New York.

Raymond Keene has also provided an in-depth answer to the question: 'Who were the greatest chess players of all time?' Read this issue and find out how Kasparov and Karpov rank against history's greatest.

And who were the greatest I.Q.s of all time? In Mental World records the candidates for the top 30 of all time are introduced – check against your own candidates and let us know.

And with all the brain power available, why *does* the Planet read so slowly? Brain Club member and World Record holder Sean Adam explores this question in a challenging feature article.

The entire staff of *Synapsia* wish all readers and Brain Club Members a gloriously happy, creative and restful Christmas Season, and a joyful end to the first year of the Decade of the Brain.
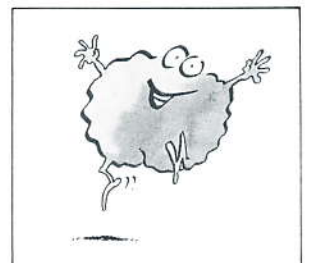
B. F. SKINNER'S LAST INTERVIEWS

Two weeks before his death, B.F. Skinner, the father of Behaviourism and one ow the world's leading investigators of behaviour, gave to the readers of Synapsia and the members of The Brain Club one of his last interviews. In the first of three wide-ranging, energetic and provocative articles, he talks of his attitude towards death and dying, approaches to physical health, thinking, communication and study, and the relevance of organisations such as The Brain Club.

SYNAPSIA

Firstly, may we thank you enormously for taking the time to talk to our members at this significant moment in your life.

You obviously have been dealing with your cancer very, very well and for many people that's a thing which they can't handle at all. Everybody I know who knows you, says you haven't changed a bit.

BFS

I am not in the least disturbed by dying. I've always known I was going to die and now I have roughly a fair idea when, I can make some plans and I don't believe in any punishment, the hereafter and so on. It just doesn't bother me in the slightest. Since I was told last November, I've had no feelings of anxiety or anything of the sort. I will enjoy myself as long as I can go on enjoying myself, then if something doesn't take me off, I'll do it myself. I love my life and I am still enjoying it.

SYNAPSIA

When you found out you had the disease, did it change your activity in terms of suddenly knowing that you had, from your point of view, say a year or a year and a half to live, instead of 8-15 years?

BFS

Well they said it would be a matter of months and I've already used up about seven or eight of those. It didn't change: I still get up at 4.45 in the morning and work from 5-7, writing a paper which I think is very important.
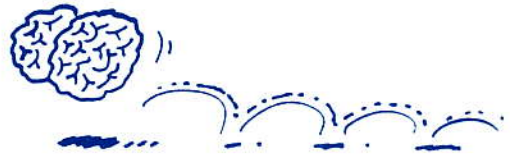
B. F. Skinner continues

venacular and cannot possibly be a science. A science which is relevant to a practice is experimental analysis of a behaviour, which goes back outside the individual.

SYNAPSIA
If you take that approach to psychology, would you call yourself a psychologist?

BFS
That's the question. One possible title for this paper was: "*Why I am not and never really have been a psychologist*!"

SYNAPSIA
Would you expand on the area of physical health, study, thinking and communication.

BFS
Yes, my response is pretty much as I outline in my paper "*How to discover what you have to say: a talk to students*".

The first step is to put yourself in the best possible condition for behaving verbally. Good physical condition is relevant to all kinds of effective behaviour but particularly to that subtle form we call verbal.

Imagine that you are to play a piano concerto tomorrow night with a symphony orchestra. What will you do between now and then? You will get to bed early for a good night's rest. Tomorrow morning you may practice a little but not too much. During the day you will eat lightly, take a nap, and in other ways try to put yourself in the best possible condition for your performance in the evening.

Thinking effectively about a complex set of circumstances is more demanding than playing a piano, yet how often do you prepare yourself to do so in a similar way? Too often you sit down to think after everything else has been done. You are encouraged to do this by the cognitive metaphor of thinking as the expression of ideas. The ideas are there; the writer is simply a reporter.

SYNAPSIA
In this context and from the behaviourist point of view, how would you define the "You" who has something to say?

BFS
As a member of the human species "you" are absolutely unique genetically unless you have an identical twin. You also have a personal history that is *absolutely unique*. Your identity depends upon the coherence of that history. More than one history in one lifetime leads to multiple selves, no one of which can be said to be the real you. The writer of fiction profits from the multiplicity of selves in the invention of character.

We also display different selves when we are fresh or fatigued, loving or angry, and so on. But it is still meaningful to ask what you have to say about a given topic as an individual. The you that you discover is that you that exists over a period of time. By reviewing what you have already written, going over notes, reworking a manuscript, you keep your verbal behaviour fresh in your history (not in your mind!), and you are then most likely to say all that you have to say with respect to a given situation or topic.

SYNAPSIA
Do you have any rules for preparing and organising your thoughts before putting them into a final linear form?

BFS
Yes, when preparing speeches or written material, I have found the following rules helpful:

Rule 1: Stay out of prose as long as possible. The verbal behaviour evoked by the setting you are writing about does not yet exist in the form of sentences, and if you start by composing sentences, much will be irrelevant to the final product. By composing too early you introduce a certain amount of trash that must later be thrown away. The important parts of what you have to say are manipulated more easily if they have not yet become parts of sentences.
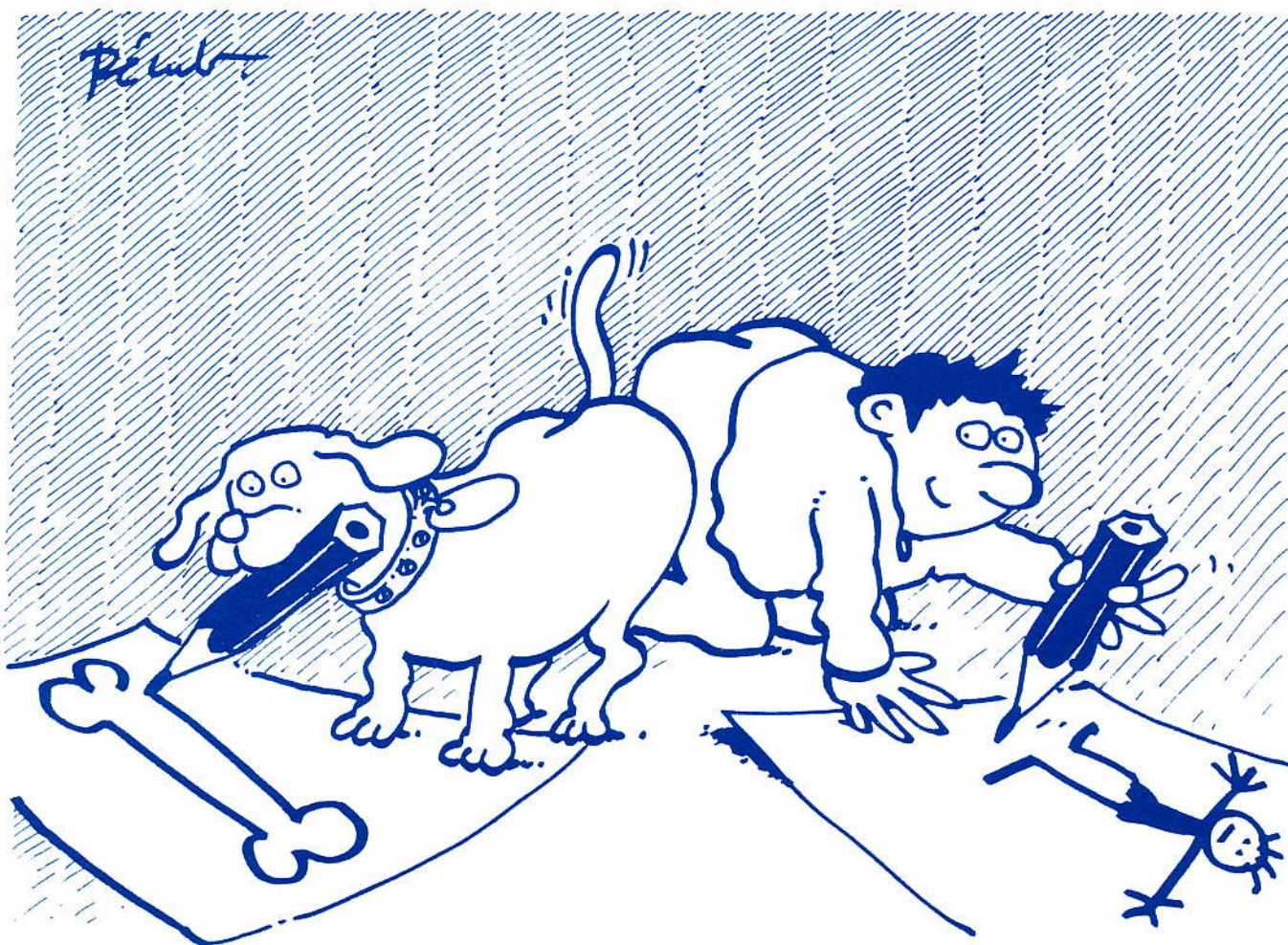
Geneticists are beginning to talk about designing species and getting rid of defects

Rule 2: Indicate valid relations among responses by constructing an outline. Very large sheets of paper (say, 22 by 34) are helpful. Your final verbal product (sentence, paragraph, chapter, book) must be linear – with a bit of branching – but *the variables contributing to your behaviour are arranged in many dimensions*. Numbering the parts of a composition decimally is helpful in making cross-references and temporary indexes and in noting connections among parts. As bits of verbal behaviour are moved about, valid arrangements will appear and sentences will begin to emerge. It is then time to 'go into prose'.

SYNAPSIA
Do you see any value in organisations concerned with the unique "You", the brain and intelligence like the Brain Club and Mensa?

BFS
These people might be immensely important. They should organise in such a way as to be more important than they are when unorganised. This would be true only if importance were defined somewhere along the line.

I could wish that such an organisation would be particularly concerned with the design of a culture. This is something that has hardly emerged at all.

Geneticists are beginning to talk about designing species and getting rid of defects. If they knew how to twiddle the right gene to do that they could be able to design a culture.

We have actually been doing it for several thousand years. We have discovered better ways of teaching, better ways of collecting taxes, better ways of paying wages and so on. We do it all very badly, but it will be very important in the next century.

Some say, "I don't really care if the human race survives, I'm going to eat, drink, be merry and have no children – that solves the problem." That is a suicidal aggrandisement of the individual which could be the net result of a democratic philosophy. That would be a terrible thing, because it would mean that the whole democratic philosophy has a lethal trait.

Democracy so far has been an effort to free us from subversive techniques of control. I accept all that; I wouldn't want to stop it.

But it is important to face the fact that education is controlled, personal relationships are controlled, and that all governments control. If you are going to throw all these out of the window, you'll come out with nothing. You'll have no culture left.

Control, of course, may be positive but there is a real danger there, because one of the good things you can say about punishment is that it encourages revolt, which alternatives don't.

In future issues Professor Skinner covers a vast range of topics, including love, the creative mind, art, education, children, his own youth, the major influences on his thinking, the nature of work, approaches to ageing, the environment, reward and punishment, and the future of humankind.

7

WORLD CHESS CHAMPIONSHIP

by Raymond Keene OBE

We are now at the half-way stage in the World Chess Championship match between superstars Gary Kasparov and Anatoly Karpov. This is the fifth world match between the two men in the past six years. It is hardly surprising that current World Champion, Kasparov, refers to Karpov as "my permanent opponent". This match is the culmination of a mighty gladiatorial contest. Since 1984 the two Titans, towering head and shoulders above all other Grandmasters, have been locked in personal combat, a remarkable period for any sport.

Play started in New York on Monday October 8th, where the match has been funded by media magnate Ted Field. At the end of November the venue will switch to Lyons under the aegis of the mayor, chess fanatic Michel Noir. Victory will go to the first of the two combatants to score more than twelve points out of the maximum twenty four games.

The two combatants have very different styles both on and off the board. Former World Champion Karpov is quiet, shy and retiring, the model Soviet citizen. He became World Junior Champion in 1969. Six years later in 1975 he won the World Championship by default, when Bobby Fischer refused to defend his title. Initially his reputation as a sportsman suffered for winning world championship status without playing the elusive American. It was widely believed that had they played, Fischer would have crushed his young opponent. For many Fischer would always remain the world champion in exile.

But Karpov soon dispelled such beliefs. He proved immensely difficult to beat. His play resembles that of a deadly spider weaving a complex and subtle web, probing inexorably for his opponent's vulnerable points. In the decade after 1975 he played in and won nearly every major tournament and his match record is similarly impressive. He retained the title in 1978 and 1981 in matches against the defector Viktor Korchnoi, whose Soviet citizenship has only just been restored by the authorities. In 1984 he met Kasparov for the world title for the first time. Their match was to prove the longest and most acrimonious in the history of chess.

In contrast, the flamboyant Kasparov encapsulates the new Soviet spirit of glasnost and perestroika. He is considered by many to be the most exciting and innovative player of all time. In the last nine years he has lost to only fourteen opponents – three world champions and the rest all Grandmasters. Since 1982 he has won the coveted "chess Oscar" for the world's best player seven times and the January 1990 official FIDE list gave his Elo rating as 2800, the first time a player had ever reached that magic mark and the first time that anyone had bettered Fischer's previous all time high of 2785. The son of a Jewish father and an Armenian mother, he was born in Baku, the capital of Azerbaijan on April 13 1963. His chess talents shone early and his rise was rapid. He qualified as a Grandmaster in 1980 at the astonishing age of seventeen, within two years he was rated as the second strongest player in the world. In November 1985, aged twenty two he toppled Karpov to become the youngest World Chess Champion, since the institution of the official title.

The differences between the Champion and his challenger have been highlighted by the extraordinary history surrounding their marathon series of matches for the supreme title. Their first clash came in Moscow in the autumn of 1984. It was hailed as a battle between two different Soviet philosophies, Karpov on the one hand represented con-

problem
(h3 Qh2 mate)
4 ... Qxe8

formity to the established regime, while Kasparov had emerged as a constructive critic of the state, eager to forge contacts with the west. The world title was to go to the first to achieve six wins, there was no other limit on the duration of the match.

In the first nine games Karpov demonstrated his dominance as world champion, notching up four

wins and five draws. In contrast, Kasparov, the young challenger, was lacklustre and unable to fight back. At the age of twenty one he had not yet had enough experience of top level match play to utilise his

aggressive style to good effect. In games ten to twenty six Kasparov tenaciously held his opponent to a string of draws, in which Karpov was unable to make a breakthrough until game twenty seven. Now the world champion was poised for victory, needing only one more win to retain his title, but he was unable to administer the *coup de grace*. He seemed alarmingly lifeless in spirit

and there were rumours that he was both physically and mentally worn down by this unprecedented marathon match.

There followed a sequence of a further twenty one games, with 18 draws and three wins to Kasparov, his final two wins coming in a burst in games forty seven and forty eight. At that point the five month challenge was unexpectedly halted by Florencio Campomanes, the Philippino President of FIDE, when the score was five wins to Karpov, three wins to Kasparov and no less than forty draws. Campomanes publicly declared that the match had exhausted the participants and ordered a rematch, despite the angry interjections of Kasparov, who demanded to play on.

Kasparov himself remained bitter about the halt to proceedings at a point where he had seemingly found his form. This gave him the extra determination to succeed when the rematch was held in Moscow at the end of 1985. There was one major rule change and this and all future matches were to consist of no more than twenty four games. It was obvious that both players were in splendid form both physically and in terms of the quality of their performance at the board. The two were well matched and everything hung on the dramatic last game of the series. Kasparov went through the tortures of the damned in defending against Karpov's vicious attacks. Ultimately, in a ferocious time scramble, Kasparov sacrificed two pawns and struck back with a deadly counterattack. In so doing he became, at twenty two, the youngest world champion in the history of the game.

The two rivals were now due to meet for a third time in as many years.

The 1986 match commemorated the centenary of the World Championship, inaugurated in 1886 when Steinitz defeated Zukertort. The first leg of the centenary match was held in London, under the auspices of the recently defunct GLC. *The Times* and British Airways also provided invaluable sponsorship. The second half was played in Leningrad. Kasparov took an early lead, by the end of game sixteen he had scored four wins to Karpov's single victory. Then Kasparov suffered three consecutive losses. Surely, many thought, Kasparov was finished and could not recover from such an onslaught.

But then Karpov unaccountably chose to take one of his permitted rest days. This was undoubtedly a crucial error on the part of the former champion. The respite gave Kasparov the chance to reorganise his tactics and he powered through the final five games, drawing four and winning one to take the title for a second time.

The fourth Kasparov-Karpov battle for the world title was launched in Seville in October 1987. Karpov demonstrated that he was by no means finished as a contender, taking a three points to two lead in the first five games. Kasparov's blunder in game twenty three appeared to have cost him the title, but in game twenty four he fought back. His superb endgame technique secured a win and left Kasparov in possession of the coveted world championship title for a further three years.

At the world chess federation annual congress at Puerto Rico in 1989 FIDE decided, without consulting the players, that the current match would take place exclusively in the

WORLD CHESS CHAMPIONSHIP

French city of Lyons. Predictably Kasparov, Karpov and the leading challengers, including our own world title semi-finalist, Jon Speelman, were unhappy with this decision. The Grandmaster Association demanded a voice in deciding the location of the championship. After lengthy negotiations the match was to be shared between Lyons and New York. Kasparov himself had sought out sponsors in New York, since he believes that chess needs the backing of the world's wealthiest nation in order to make an impact on public awareness.

The first half of the match has finished with the contestants level at 6 points each. The even score belies the ferocious chessboard duel that we have witnessed over the past month. The games have been characterised by the players' deep determination to win. Devastating sacrifices and fierce knock-out blows have been delivered by both sides in the pursuit of victory. Indeed in many ways they are already rewriting the chess history books. Kasparov has re-minted the idea of 'sacrifice', teetering on the abyss of what seemed like certain defeat to the eyes of others, only to 'recover' brilliantly.

Karpov has similarly taken the art of defence to new heights, introducing stinging and lethal counter-attacks. So lofty is the level of their combat, that at many times in the first twelve games, all the international Grand Masters watching the game as it progressed were disagreeing on not only the result, but also the next move! Only after hundreds of hours of post-game analysis did it appear that during the games themselves only two people in the world had a relatively clear idea of what was going on: Kasparov and Karpov!

The calculations of Professor Nathan Divinsky, a statistician from the University of British Columbia, demonstrate that Kasparov and Karpov are the two greatest players of chess history, dwarfing even the legendary American World Champion Bobby Fischer. Divinsky's analysis of the results of the sixty four all time best players against each other has produced a definitive ranking of the elite, which places Kasparov in the number one slot by a wide margin, with Karpov at number two. If Professor Divinsky is correct then the current match will continue to produce the most superb level of chess in history!

CHECK MATE

Chess positions for *Synapsia Magazine* set by Raymond Keene, OBE

This position is taken from the game
White – King Black – Frias
Watson, Farley & Williams/City Of London Corporation 1990
The Black knight on e7 is only defended by the queen.
How can White exploit this?
Solution in next issue.

Solution to the problem in the last issue:
1 ... Qg1+! 2 Kxf3 (2 Kh3 Qh2 mate)
Qf1+ Ke3 Qe1+ and 4 ... Qxe8
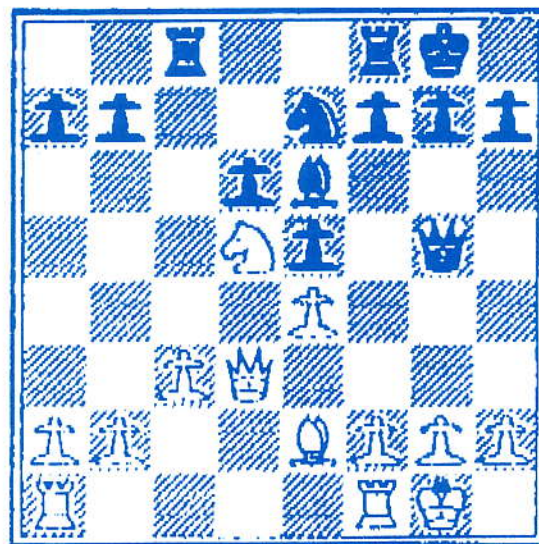
BEATEN BY MEGABYTES?

Do Computers Think Like People?

by David Levy

Brain Club Member David Levy is renowned as the man who in 1968 bet artificial intelligence professors that no computer programme would win a chess match against him within 10 years, and won! He is also the President of the International Computer Chess Association. In this article he explores one of the most intriguing questions from the world of intelligence....

The idea of automating human thought processes dates back at least two hundred years and has fascinated mankind ever since. It was in late 18th Century Austria that Baron Wolfgang von Kempelen, Aulic Counsellor to the Royal Court of Vienna, built the "Automaton" that could play a brilliant game of chess. Represented by a life-sized figure of a Turk seated on a box, the Automaton amazed spectators and reputedly caused one courtier to faint. There was, of course, a man hidden inside the box, but Kempelen's elaborate hoax was not futile – it sowed the seed of "thinking" machines.

A few decades after von Kempelen, the English mathematician and engineer Charles Babbage designed his "analytical engine" which, alas, was not completed. As early as the 1840s Babbage considered it feasible to make such a device play chess. In "The Life of a Philosopher" he wrote:

> After much consideration I selected for my test the contrivance of a machine that should be able to play a game of purely intellectual skill successfully; such as tic-tac-toe [noughts and crosses – DL], drafts, chess, etc.

What Babbage could only dream about became a reality with the advent of the electronic computer just over a century later. The first program to play chess was written for an IBM 704 computer in 1957 but, not surprisingly, it played a very weak game. Ten years later a program written at MIT was strong enough to play in local amateur tournaments, and by 1970 there was sufficient interest in computer chess to hold regular tournaments in which all of the contestants were computer programs. Spurred on by the desire to win these tournaments, chess programmers made steady progress during the 1970s and 1980s. As we enter the 1990s the question being asked is no longer "Can a program defeat a future World Champion?", but "When will a program beat Kasparov?" An electronic chess Grandmaster, Deep Thought, is already with us, sitting on a printed circuit board small enough to fit inside a briefcase.

Many argue that computers, or more precisely computer programs, cannot think. That they cannot be intelligent. I do not intend to address this philosophical question here, beyond making the point that "everyone knows" that one needs to be intelligent to play good chess. Deep Thought has beaten Grandmasters, ergo it must be intelligent.

Relying on the premise that computer programs do think, let us now consider whether game-playing programs think in an analgous way to humans. In chess, at least, the answer appears to be yes and no.

The programming structure which enables a program to play chess and several other games is called a "tree". The program's task is to decide on a move from a given position, and it represents that position as the "root" of the tree. Each of the possible moves from a position is represented by a "branch" of the tree and at the other end of a branch is the new position.

Growing a tree to represent the myriad possibilities on the chessboard is a straightforward task, accomplished by a module in the program called the "legal move generator". What is much more difficult for a program is accurately evaluating the positions that arise in the tree. Without a reasonably sensible "evaluation function" a program could look a long way ahead but have little or no understanding of what it was looking at.

Clearly some chess knowledge is needed in the evaluation function. Representing such knowledge in

purely numeric terms is far from simple. With little knowledge at its disposal, an evaluation function will provide only a crude, often erroneous distinction between good positions and bad ones. With a lot more chess knowledge the evaluation function becomes much more accurate, and will sometimes be able to pick the best move in a position without using any look-ahead. But one of the problems facing chess programmers is that evaluation functions with more knowledge require more time to compute, reducing the depth of look-ahead that can be achieved within the allotted time per move. A search which thereby becomes too shallow can lead a program to make tactical oversights, unnecessarily losing material or succumbing to checkmate.

Evaluation functions in game playing programs are also employed to determine which moves a program should examine, making selectivity possible. With an average of 37 moves in a chess position, it is easy to comprehend that the problem of looking ahead to a significant depth can be immense. After only one move by each side there are more than 1,000 positions to evaluate. After two moves by each side the number rises to over 1 million. Deep Thought, by using some clever programming tricks, looks at everything at least five moves ahead by each side, and it examines the tactical variations which it considers most interesting to a depth of 10, 15 or even more moves by each side. In contrast to these 'telephone numbers' a strong human player will typically evaluate only 50–150 positions during a 3 minute analysis. Herein lies the

big difference in thinking between human Grandmaster and computer Grandmaster – the human knows which moves to select for examination. His evaluation function is sufficiently knowledgeable.
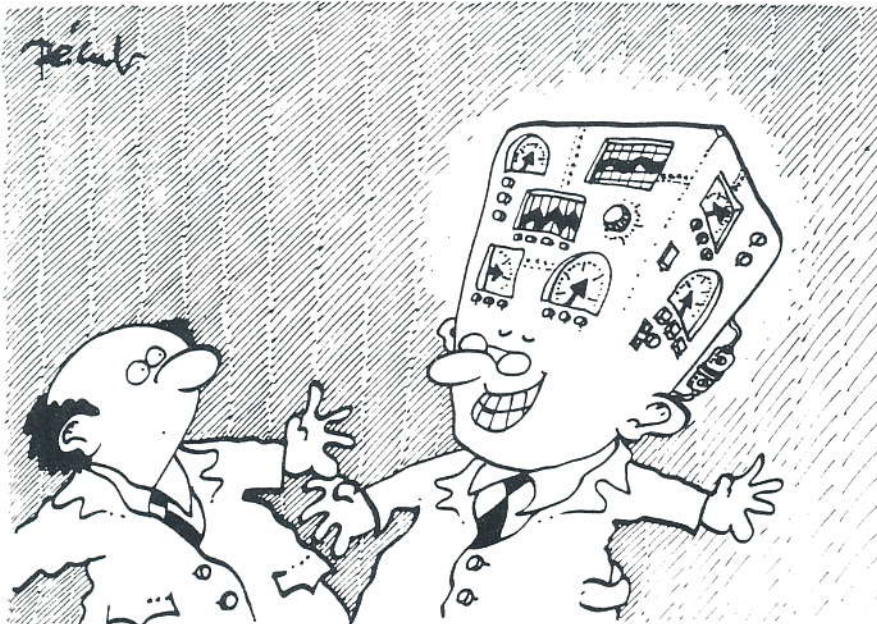
THE DIFFERENCE

It is possible to summarize the difference in thinking between Deep Thought and Gary Kasparov thus: The computer performs the task of evaluation fairly competently but not brilliantly, though it does so millions of times whenever called upon to decide on its move. In attempting to emulate and surpass human Grandmasters it performs the task of evaluation less intelligently, in the chess sense, but it does so much more often. Kasparov's evaluation function is fine-tuned to the point of perfection, but he needs to apply it less

than once per second. He uses his accurate evaluative skill to select those moves which deserve to be considered, and to prune out the dross. His highly selective search enables Kasparov to keep the size of his own game tree to within manageable proportions.

BRUTE FORCE vs SELECTOR SEARCH

Because chess programmers have not yet been able to encapsulate all human chess knowledge in numeric evaluation techniques, the art of chess programming has largely relied on ever faster hardware. Deep Thought uses a microchip designed specifically and only to play chess and which performs the tasks of move generation and position evaluation at amazing speeds. A debate has long raged between two schools of chess programmers: which of "selec-

tive search" and "brute force" should be the more successful strategy? At the moment the brute force school is winning, so one needs to ask the question "Will more brute force alone be enough to defeat Kasparov?" There are those, including Deep Thought's designers, who believe that existing evaluation techniques, together with an extra 2 moves of look-ahead for each side, will be sufficient to create an electronic monster strong enough to challenge the human World Champion. Others, notably the stronger chess players within the computer chess fraternity, believe that greater selectivity (i.e. more embedded chess knowledge) will be required.

Amongst the thinking games that have been programmed, chess has been witness to some of the greatest successes. It is estimated that some 10,000 people have written chess programs. More than 20 books, dozens of university theses and hundreds of academic papers have appeared on the subject. This information has been available for those who have programmed other thinking games, with the result that human champions have been vanquished in activities other than chess, but in most cases the "thought processes" of the programs have been very different from those of human players.

The game of Reversi, invented in England in the 1880s but more recently renamed and remarketed as Othello, presents fiendish difficulties for the human who wishes to analyze deeply. In making a move a player must, by the rules of the game, change the colour of one or more of the discs already on the board, from his opponent's colour to his own. Trying to analyze, even two or three moves ahead by each side, is a horrendously daunting task for a human, when discs can change from white to black and back to white again... and the mind's eye must retain an image of the board during this analysis. In fact the world's best human Reversi players depend little on look-ahead analysis but rather more on "structure" and "zugzwang" when planning their moves. Structural concepts help them to recognize which are the good and bad squares on which to place their discs. Zugswang, the compulsion to move when to do so is a disadvantage, helps humans to run their opponents out of acceptable moves. In contrast, Reversi programs use brute force techniques à la chess,

looking ahead 10 moves or more by each side. Even the human World Champion would not be able to analyze a single variation 10 moves ahead by each side and retain an accurate image of the resulting position.

COMPUTER WORLD CHAMPION BEATS HUMAN!

How do the differences between Reversi and chess manifest themselves in the results of the strongest programs? In 1980 a computer program called The Moor defeated the human World Champion Hiroshi Inoue of Japan. Since then the best programs have become stronger, but so have the best human players. Last year, at the 1st Computer Olympiad in London, a team of the strongest programs scored a 12–8 victory in a match against 4 of the world's top human players. Here then, brute force programming has triumphed over the human's highly sophisticated selectivity.

Many other board games are suited to the tree structure used for programming chess and Reversi. Obvious but very different examples are draughts and Go. Draughts is a simpler game than chess and it is easier to program. This relative simplicity makes programming draughts less challenging than programming chess, though paradoxically, considerably less work has been done on draughts. But last year, in Alberta, one of the world's most experienced chess programmers turned his hand to draughts, employing most of the tricks of the chess programmer's trade. Within 6 weeks he had a program called Chinook that defeated a local master.

One of the reasons for the program's success is its use of a massive database of endgame positions. The programmer, Professor Jonathan Schaeffer, has enabled the program to analyze back from the end of the game so that it knows the correct assessment of every position in the database and what move should be made if that position were to occur in a game. Up to now his database includes every position with 6 pieces or fewer on the board. Within a few moves of the start of a game Schaeffer's program is already analyzing some variations deeply enough to reach positions which are in his database, positions whose evaluation is therefore flawless. With the advent of ever larger computer memories, and after another 4 or 5 years work, I expect Schaeffer's data-

base to be expanded to the point where his program can beat Dr. Marion Tinsley, the American who has long been the Gary Kasparov of the draughts world. But when it does so Schaeffer's program will be using almost no intelligence. Evaluation functions, the intelligence and foundation stone of the chess program, will have been replaced by the database. Winning the intellectually skilled game of draughts will have been reduced to looking up a number in a gigantic table of data.

Go, in contrast, despite lending itself well to the game tree representation, has hitherto proved to be a much tougher nut to crack. The best Go programs of today are very weak amateur strength. In part this is due to the much larger game trees – the number of legal moves in a Go position is 361 at the start of the game, reducing slowly to around 150–200 by the end. Another important difference between Go and games such as chess and draughts is that in Go a high ranking "Dan" player will tell you that he can look 100 moves ahead! What he means is that he can imagine roughly what the board will look like 100 moves hence, not that he can analyze a variation 100 moves deep. An important, unanswered question in Go programming is "How can a program hypothesize positions this far ahead?"
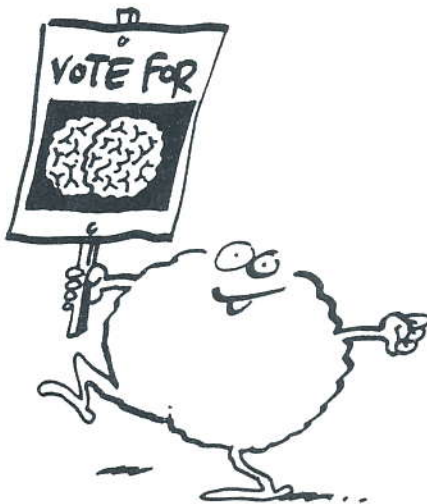
The programming of certain games such as backgammon and bridge requires different approaches. Each is a game of "imperfect information", which is to say that normally one cannot know, with any certainty, which moves or plays the opponent might make. In backgammon it is the dice that determine which moves will be legal. In bridge it is the location of the unseen cards.

Backgammon has been programmed to a very high level by Hans Berliner, who is an International Master at chess. Berliner's program employs a highly sophisticated evaluation system which very closely models the thinking of strong human players, and like humans it uses no lookahead. In a sense Berliner's program exhibits the greatest genuine intelligence yet seen in any "thinking game" program, and it won a short match in 1980 against the World Champion, Luigi Vila.

And what of bridge? Zia Mahmood has offered a one million pound prize to whoever first writes a program that can defeat him and his chosen partner. I believe his money to be unsafe. A Swede, Edvin Lindelof, has already devised and developed Cobra, a human-like bidding system whose results in tests compare favourably with those of human experts.

The correct play of the cards in bridge is obviously hindered by the fact that at trick 1, the crucial moment when declarer must plan the play of the hand, he can only be certain of the location of half the cards. Since statistical methods exist which could allow a program to calculate the probabilities of various distributions of the cards, the problem of finding the best play could be solved with a computer. Such a program would be the ultimate example of playing "with the odds", performing calculations in probability theory with a skill unattainable by humans. To accomplish this within a reasonable amount of "thinking" time would require hardware with the power of Deep Thought, and if the same effort that has gone into D.T. were to be correctly applied to bridge, I believe that Zia Mahmood will be pulling out his cheque book before the end of the decade.

CONCLUSION

Berliner's work on backgammon has shown that in some areas of intellectual endeavour, it is possible for the computer to surpass the skills of highly capable humans by imitating human methods, but implementing those methods more accurately. Work on other games, chess and Reversi for example, suggests that the way to success lies in being less "intelligent" than humans but doing so very, very often. As to the question "Do computers think like people?" the answer appears to be "sometimes".

ANIMAL INTELLIGENCE

PRETTY POLLY, *CLEVER* POLLY!

Mowgli discusses new evidence suggesting that 'Pretty Polly' may be as smart as the Primates.

More evidence has come to light showing that a bird brain is indeed a good brain, and that we would do well to look more intelligently and understandingly at our feathered friends.

The state-of-the-art work in this area is being done by such as Irene Pepperberg of North Western University in Evanston, Illinois. Pepperberg has been studying the psychological abilities and needs of parrots, especially the cognitive processes of one African Grey parrot (*Psittacus Erithacus*) for some twelve years. She claims that Alex, her African Grey, does *not* mimic English language only in what will now become an oxymoronic phase: 'parrot-fashion' – he demonstrates an understanding of abstract concepts at a level so far attributed only to primates.

Pepperberg first taught Alex the English labels for eighty familiar objects. Then, following experimental procedures very similar to those used on experiments with chimpanzees, she discovered that Alex can perform a range of mental tasks.

Alex can:
1. Categorise objects according to colour.
2. Categorise objects according to shape.
3. Categorise objects according to material.
4. Identify quantity for collections of up to six objects.
5. Understand and use the concept 'same or different'.
6. Understand and use the concept 'none'.

This last skill has enabled Pepperberg to show that Alex can discriminate between totally unfamiliar items on the basis of abstract categories – recognising the relationship, for example, between a green pen and a blade of grass.

In a typical 'transfer' test involving unfamiliar items, the parrot was presented with two objects at the same time, such as a piece of white paper with five corners and a pink woollen pompom. He was then asked "What's same?" and "What's different?" He responded in terms of colour, shape and material.

Since the beginning of the experiments, Alex's repertoire has been extended to include the concept 'none' and he has been able to indicate the absence of a similarity or difference between two objects.

Parrot Brain versus Pigeon Brain

From the question of whether or not the parrot's abilities are the same as other birds, Pepperberg comes down, so far, on the side of the parrot, maintaining that Alex's abilities are significantly ahead of other birds. A pigeon, for example, may learn to peck a key to show that two sequentially presented colours are the same or different, but it can rarely transfer this ability to unfamiliar items – a task non-primate mammals also find difficult. The pigeon's successful responses are more likely to be the result of being able to make associations between specific objects rather than an ability to understand colour as a category.
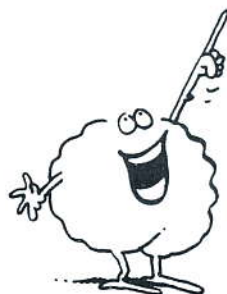
The quest is now on to see whether or not Alex will match the intellectual ability of the language-trained chimpanzees, such as David Premack's Sarah. Sarah demonstrated her ability to reason in an analogical fashion, understanding the relationship between relationships. For example, when presented with a lock and key together, Sarah correctly recognises 'can opener' as the corresponding analogue to 'can'.

"Intellectually, I don't know where Alex is going," says Pepperberg. Emotionally, however, she regards him as equivalent to a two-and-a-half to three-year-old child, and he spends eight hours a day in human company. "He is very demanding, very interactive," she says, claiming that people don't yet realise how much attention on both the intellectual and emotional level parrots need.

Confirming Pepperberg's findings and feelings is Caroline Pond, a biologist at the Open University in Milton Keynes. Pond has also kept an African Grey, which has lived with her for sixteen years: "She is remarkably apt. You can see her thinking as she looks for the right word. Other times she just babbles, particularly in a crisis. She is extremely good at soliciting and getting attention."

James Serpell, of the Department of Veterinary Medicine at the University of Cambridge, and his Companion Animal Research Group, agrees. Serpell believes parrots should be kept as pets only if their owners are prepared to devote as much time intellectually and emotionally stimulating them as they would a human child. "It's a full time job," he says. In addition, this 'child' never grows up, yet may outlive its owner and may have to be written into his or

her will in order that someone else may continue with the care.

Serpell and others have found that parrots, like humans, are capable of depression, boredom and frustration. "In such states, the birds will pluck out their own feathers until denuded from the neck down. The animal may also display distressing and distressed stereotyped patterns of behaviour. Parrots will also suffer unless they are kept in large aviaries with other members of their own species," says Serpel.

His conclusions are derived in part from his study of communication among a flock of Loriine parrots of the genus *Trichoglossus*, caught in the wild. These parrots inhabit Indonesia, Australia and the Pacific, and participate in a complex network of co-operative ritual displays based on their strong monogomous pair bonds. For instance, the parrots perform 'eye-blazing', expanding their bright orange irides, and displays such as 'crouch quivering' and 'hiss ups' (a cross between a hiss and a hiccough!) to deter rivals, warn of danger or diffuse aggression within the pair. Even among parrots, *Trichoglossus* is unique in the diversity of its display repertoire. "Parrots are like primates, very clever and manipulative. They are the flying primates," again asserts Serpell.

The comparison with primates recurs in what Annabelle Birchal of *New Scientist* magazine calls the 'centuries old debate' over 'footedness' in parrots. The birds eat in a prehensile way by lifting their food to their beaks, raising a leg and then transferring the item to the foot. (A parrot's foot is yoke-shaped, with the first and fourth toes pointing backwards, and the second and third pointing forward.) Many people have speculated whether the bird's apparent preference for manipulating food with the left foot is comparable to the dominance of right-handedness in humans. This question becomes even more fascinating and complex in view of the parrot's linguistic skills: in 1865, as Brain Club Members will probably know, Paul Broca, the pioneering neurologist, initially proposed that language and right-handedness were controlled from the left cerebral hemisphere of the brain. Sperry, Ornstein and Block's work in this arena have continued and refined Broca's original hypotheses.

With regard to the parrot, Lauren Julius Harris, of Michigan State University, recently reviewed the evidence in the *Canadian Journal of Psychology*. She concluded that both South American and Australian parrots are predominantly left-footed, often to the same degree as humans are right-handed. Like humans with their hands, parrots use their dominant foot for tasks that require only one limb: for example, to pull a piece of sticky tape off the beak. No one yet knows whether their foot preference is matched by greater ability with the dominant foot, as it appears to be in humans. Research into this area is continuing apace, and *Synapsia* will keep readers updated of the continuing results.

Returning to the question of parrot intelligence in relation to primates, Charles Munn, Associate Research Zoologist with Wildlife Conservation International (a division of the New York Zoological Society), has been sitting in a harness 40 metres above the ground in the Peruvian rain forest for up to ten hours a day, studying the behaviour and intellectual ability of these birds. Like Serpell, he is particularly impressed by the similarities between the primates' and the parrots' intelligences and the complexities of their social structure. The young birds Munn studied stayed with their parents for several years and learnt much during their development. Munn says, "They have far larger brains for their body size than most other birds – on a par with owls and crows – and I believe we are just seeing the tip of the iceberg of their abilities."

Synapsia readers interested in finding out more about parrot research can contact the World Parrot Trust, Hayle, Cornwall. Mowgli would appreciate readers sending in their own stories of animal intelligence and animal memory.

A DOLPHIN TALKS TO MOWGLI

Dear Mowgli,

In the Summer of 1990 a happy and historic event took place: the first meeting between dolphins and human members of the Brain Club.

It was one of those clear, sunny and idyllic days at the beginning of September in Freeport, The Bahamas.

I and a few dolphin friends are the only dolphins in the World who have *chosen* to live with humans, and who have made that choice for virtually every day of our lives.

In Freeport they have given us a beautifully protected harbour, and an especially protected aquarium in which we can sleep safely, and in which we can play and frolic with humans.

On the morning in question we raced the boats out into the open ocean, playing surf-riders in the bow and stern waves as the whole party of us, dolphins and humans, headed a few miles offshore.

When the water was 40 feet deep, we all stopped, and the humans put on their deep-sea diving gear, tumbling into the water a bit like unco-ordinated crabs!

One of your Brain Club members, who had given time with me as a gift to the other, stayed on the surface and watched, while the other sank down and down, bubbles streaming from his breathing apparatus, to the exquisite and gently pulsing garden on the ocean floor. I saw myriads of rainbow coloured fish escorting him inquisitively as he descended.

The whole purpose of the meeting was, of course, to play, to frolic, to meet each other, to educate and to communicate. To do this I and my friends had worked on an under water ballet: we wove liquid patterns through the crystaline waters; we hung suspended, dolphin eye to human eye for seconds, and then off forth on swing like Gerard Manley Hopkins' windhover; from the ocean floor we rocketed to the surface, allowing his eyes to follow us into the brilliant silver circle that was the sun's reflection, and through out into air.

And we danced with your Brain Club member! Gently we approached him, performing pirouettes and aqua-leaps, and turning underwater somersaults as he fed us ocean delicacies.

In fact I enclose a photograph taken of one of my 'swim-bys' in order that you may recognise me should we (which I hope we do) ever meet.

And we stroked his outstretched hand with our entire bodies, knowing that he felt the incredible silk-like smoothness of our skins, just as we felt the child-like tenderness of his hand – you humans, it seems to us, can be very gentle and loving creatures – we feel a kinship with you.

After forty minutes our brief but eternally meaningful underwater en-counter came to an end, and I and my friends raced, once again, your Brain Club member back to the shore.

How do we dolphins join the Brain Club?!

INTELLIGENCE

ABOUT

INTELLIGENCE

by Tony Buzan
Member No. 1

An 'Even Better' Human?

A cyborg is a being part human, part technobrilliance – the Bionic Woman and the Six Million Dollar Man were among the first.

The futurist Jerome Glenn believes that the human race is actually evolving into them.

Glenn claims that cyborgs are the inevitable result of two major trends that are about to merge into one.

The first trend – the accelerating use of technology to correct physical disabilities and improve natural performance – can be seen in the progression from eye glasses to contact lenses to surgically implanted lenses.

The second trend, the tendency for technology to mimic increasingly human intelligence and form is evolving at a similarly accelerating pace. For example, in the field of "artificial" intelligence, the ability to associate ideas like the human brain, as well as the ability to speak and to recognise voices, are all within the range of today's better computer chips.

Glenn claims that these two trends will herald an age of 'conscious technology' in which 'robots will use biochips to help them become more human, and humans will become cyborgs' within the first half of the 21st century.

Glenn further claims that by the mid 21st century technology will no longer generally be limited to the simple correction of disabilities. He says that it will increasingly be used to enhance the human brain and body's range of performances: 'contact lenses with zoom vision, miniature hearing aids to hear selected sounds at greater distances, or miniature transceivers to reach out and touch someone are just some of the ways future cyborgs will go beyond our inherited biology,' Glenn says.

Synapsia welcomes your feedback and thoughts on Glenn's cyborg predictions.

Nicotine Impairs Brain Cells

New research indicates that nicotine *impairs* rather than stimulates brain cells, contrary to earlier belief, and may explain the drug's calming effect, Linda Wong of the University of Texas/Galveston said.

Wong claimed that nicotine appeared to suppress rat brain cells that control basic behaviour such as learning, memory and emotion.

Wong's experiments and conclusions were presented at the 40th annual meeting of the American Society for Pharmacology and Experimental Therapeutics in August of 1989. Her findings contradict the traditional scientific belief that nicotine stimulates brain cells.

For years scientists have believed that the drug excites some neurons, which in turn inhibit other brain functions to induce a calming effect on smokers.

Wong said that her studies on rats suggest that nicotine directly reduces neuron activity in human beings. Her findings were based on a two year study in which nicotine was applied to tissue removed from the brains of rats – the tissue was from the base of the rat's brain.

Wong said she originally sought to learn the mechanisms controlling a neuron receptor linked to the theta rhythm, an electrical current produced by the brain. It was only by chance that she and her colleagues noticed that nicotine actually *restrained* neural activity.

'It was startling and surprising,' she said. She found that nicotine makes it more difficult to fire signals to other neurons, because the drug causes the effected neuron to release potassium, which plays a critical inhibiting role in the transmission of nervous impulses.

Another explanation for the apparent 'calming' effect of cigarettes in some smokers, is that they may, every time they inhale, be suffering a 'mini-faint' due to the momentary lack of oxygen to the lungs and brain!

THE FIRST WORLD MEMORY CHAMPIONSHIPS

The first World Memory Championships will take place in Roma, Italy on Saturday 31st August 1991!

The Championships, which Brain Club members are encouraged to train for and attend, will include six major categories:

1. *Names and Faces.* In this competition 200 'new' people, with names from many different nations, will be introduced to the finalists, and will then reappear for identification.

2. *Word Memory.* A gigantic screen will display 300 words, for a total of 6 minutes. The winner will be the Memory Master who can remember most of them in order and randomly.

3. *Language Memory.* Contestants will be given words and phrases in 7 different languages, the winner being the one who can learn the most new words and phrases within a half-hour time period.

4. *Number Memory.* The competition will be divided into two sections: First, memory of numbers presented at a rate of approximately a second each; second, the competition similar to the Word Memory competition in which a 300-digit-long number will be presented on a gigantic screen, for 6 minutes, the winner being the individual who can remember as much of the entire number as possible. In this competition and the word competition, the winners will give demonstrations of mental gymnastics, showing how they can remember sections within what they have memorised, as well as 'reverse' memory skills.

5. *Magazine Memory.* In this competition competitors will be required to spend half an hour reading a newly-published magazine, and then to memorise as much of it as possible. Judges will ask such questions as 'what is in the bottom left hand corner of page 55?'!

6. *World Memory Records.* A special section of the day will be devoted to inviting Memorisers from around the World to come and establish new World records in *any* field of memory. These events will cover the entire range of memory skills, and members and others are encouraged to start selecting their event and training now!

The event is being co-sponsored by MEMOTEC, a major Italian organisation specialising in memory and memory skills, and by Giancarlo Nacinelli, the founder of MEMOTEC.

Synapsia is pleased to include the Mind Map for the Memoriad which appeared on the front cover of the Italian magazine *Memo News*.

For further details, please write to the Editor, *Synapsia*.

AMAZING MEMORY STORIES

WHY A RUSSIAN MEMORY GENIUS THOUGHT HE WAS STUPID AND WAS PROVED WRONG

by Tony Buzan
Member No. 1

In the early spring of 1973 I travelled to Moscow to meet Alexsandr Romanovich Luria, Russia's eminent psychologist, who had studied under Pyotr Anokhin and the world-famous Pavlov. I was invited into his home to discuss an extraordinary Russian individual by the name of Shereshevsky, who had come to Luria's attention in the nineteen twenties. The meeting had so influenced Luria that he wrote an entire book, *The Mind of a Mnemonist*, on both his meeting with Shereshevsky ('S') and the following thirty years in which the two worked together.

Shereshevsky was brought to Luria's attention because of the following intriguing tale:

Shereshevsky was a newspaper reporter in Moscow. Each morning the Editor of the newspaper would have a Staff Meeting, at which he would hand out assignments for the day: list of places he wanted covered; and information to be obtained from each event.

This list of instructions and addresses was usually quite long, and the Editor began to note with increasing surprise that 'S' never took any notes. He was going to 'take the reporter to task' for not paying attention, but decided first to check whether 'S' knew anything of what he had been asked to remember. The Editor sat amazed when 'S' repeated the entire assignment *word for word, phrase for phrase, punctuation mark by punctuation mark, rhythm for rhythm* and *accent for accent!*

Flabbergasted, the Editor immediately reported this unbelievable feat to Luria, who at that time was the rising young star in the international psychological community. The two men met, starting a relationship that at first confounded and then educated the human race on the nature and potential of the human memory.

Over the years the two men played memory games together, and devel-oped a deep understanding of the special techniques that 'S' had used, from the time when he was a tiny child, to develop his gigantic 'Memory Muscle'.

One of the most spectacular examples, which incorporated a number of 'S's' Memory Techniques, occurred toward the end of 1934. 'S' was asked to recall a 'mathematical' formula that had simply been made up and had no meaning. Following is the example, and how he memorised it:

$$ N. \sqrt{d^2\, x\frac{85}{vx}} . \sqrt[3]{\frac{276^2\,.\,86x}{n^2v.\,\pi 264}}\, n^2b = sv\frac{1624}{32^2}.r^2s. $$

'S' examined the formula closely, lifting the paper up several times to get a closer look at it. Then he put it down, shut his eyes for a moment, paused as he 'looked the material over' in his mind, and in seven minutes came through with an exact reproduction of the formula. The following account of his indicates the devices he used to aid him in recall.

Neiman (N) came out and jabbed at the ground with his cane (.). He looked up at a tall tree which resembled the square-root sign ($\checkmark$), and thought to himself: 'No wonder the tree has withered and begun to expose its roots. After all, it was here when I built these two houses (d^2). Once again he poked with his cane (.). Then he said: 'The houses are old, I'll have to get rid of them (X);' the sale will bring in far more money. He had originally invested 85 000 in them (85). Then I see the roof of the house detached (–), while down below on the street I see a man playing the Termenvox (vx).

He's standing near a postbox, and on the corner there's a large stone (.) which has been put there to keep carts from crashing up against the houses. Here, then, is the square, over there the large tree ($\checkmark$) with three jackdaws on it ($^3\checkmark$). I simply put the figure 276 here, and a square box containing cigarettes in the 'square' (^{2}). The number 86 is written on the box. (This number was also written on the other side of the box, but since I couldn't see it from where I stood I omitted it when I recalled the formula). As for the x, this is a stranger in a black mantle. He is walking towards a fence beyond which is a women's gymnasia. He wants to find some way of getting over the fence (–); he has a rendezvous with one of the women students (n), an elegant young thing who's wearing a grey dress. He's talking as he tries to kick down the boards in the fence with one foot, while the other (^{2}) – oh, but the girl he runs into turns out to be a different one. She's ugly – phooey! (v) . . . At this point I'm carried back to Rezhitsa, to my classroom with the big blackboard . . . I see a cord swinging back and forth there and I put a stop to that (.). On the board I see the figure $\pi 264$, and I write after it n^2b.

Here I'm back in school. My wife has given me a ruler (=). I myself, Solomon-Veniaminovich (sv), am sitting there in the class. I see that a friend of mine has written down the figure $\dfrac{1624}{32^2}$ I'm trying to see what else he's written, but behind me are two students, girls (r^2), who are also copying and making noise so that he won't notice them. 'Sh', I say. 'Quiet' (s).

Thus 'S' managed to reproduce the formula spontaneously, with no errors. Fifteen years later, in 1949, he was still able to trace his pattern of recall in precise detail even though he had had no warning that he would be tested on this.

It is interesting to note that the techniques that 'S' used were not some mysterious, secret, or unusual set of devices, but were simply the basic memory principles which *all members* can use to improve the whole range of their memory skills.

BRAIN CLUB NEWS

LONDON CELL

The London Cell has been meeting on a regular monthly basis, and is continuing through its schedule of activities. Each month they are viewing one of the Developing Family Genius tapes as a way to enhance their skills in Mind Mapping, Memory, Reading and MMOST (Mind Map Organic Study Techniques). They are now on tape 2, and on a high level of discussion and refinement about Mind Maps and their applications.

Each month they are visited by several potential members – people who 'phone the Buzan Centre and say "What is a Brain Club?!?!" – we recommend a look at one in action and so far nearly everyone who has visited has been so impressed they have joined at once!

Well done to the London Cell, and its loyal members, some of whom have been meeting for over a year!

It is the London Cell that has done the initial planning and organisation for the February Dinner Dance. Please respond to their invitation and plan for an evening of fun, food, dancing and super conversations. Thanks to Jane Mitchell for all her work and enthusiasm.

WELCOME TO A NEW CELL

The University of Kent at Canterbury now hosts a Brain Club Cell. This has been pioneered by Warren Day from the Computing Laboratory – he will let us know more of the details for a future edition of *Synapsia*. Meanwhile they have begun working on speeding the imaging process to empower SEM^3. He is also interested to extend SEM^3 to one million! Warren says this is fairly easy to do, and now I wonder, who will be the first person in history to long-term-memorise one million items?

Start to practise, as you see you have the perfect challenge with the Memoriad – 31 August 1991 (see article page 19).

We look forward to your growth and stories, Canterbury Cell!

BOURNEMOUTH CELL

Due to travels of its members, the Bournemouth Cell has been getting together in mini-meetings – dinners/coffees and discussions as time and life allow.

The focus has been on the application of Mind Maps to the many facets of life. How many times a day do you Mind Map? (and why?)

Topics include: Mind Maps for families; solving problems; applied to business meetings; for making money; and for re-ordering life's priorities; also for enabling greater communication between us.

PALM BEACH BRAIN CLUB CELL

This cell has split in two for the time being. One "cellette" has continued to explore and work in-depth as the Futures Brain Club of Palm Beach, on the presentation of the concept of a total educational/community life-long-learning model project, which is taking place in Palm Beach.

The other "cellette" has applied itself to the immediate educational situation with students, parents and teachers working their way through the Developing Family Genius (DFG) tapes. They are also road testing the new manuals to accompany DFG and are adding their suggestions and refinements. (Thank you from the author of the manual.)

A full meeting, with a Study Day and celebration is scheduled for November.

* * *

NEW BRAIN CLUB MEMBERS

We give below details of our newest Members. A complete list will be sent to all enrolling Members and to existing Members on receipt of their renewal subscription; if your subscription is due for renewal you will receive an automatic reminder from The Brain Club.

NEW MEMBERS

No.	Name	Location	Country	No.	Name	Location	Country
278	Darren White	Liverpool	England	323	John Ryalls	Bristol	England
279	Michael D.T. Clark	Christchurch	New Zealand	324	Tomoki Takahashi	Minami-Ku Fukuoka	Japan
280	Julieanne Carter	London	England	325	Ian R. Martyn	London	England
281	D.E.B. Peckham	Wallasey	England	326	William O'Mulland	Cork	Eire
282	Dan Cullen	Co. Kildare	Eire	327	Lynne Gemeroy	Delta B.C.	Canada
283	Miss E. Labrum	London	England	328	Dr. Wolfgang Toglnofer	Wien	Austria
284	Rory Connor	Dublin	Eire	329	Jean Mackin	Glasgow	Scotland
285	Mrs. G.A. Bolton	Otley	England	330	Richard Lund	Blackpool	England
286	Stephen Beresford	Bingley	England	331	Kerr Manson	Dunblane	Scotland
287	Claude R. Fussler	Mettmenstetten	Switzerland	332	Philip Towers	West Norwood	England
288	Susy Churchill	Bournemouth	England	333	Glenda Hutchinson	South Caulfield	Australia
289	Timo Teras	Helsinki	Finland	334	Sir Brian Tovey	London	England
290	Tore Houland	Oslo	Norway	335	Lady Mary Tovey	London	England
291 – 292	Held			336	Mr. R.A. Howe	Carlisle	England
293	James F. Young	Dallas	U.S.A.	337	Kevin A. Phoenix	Nailsea	England
294 – 313	Held			338	Mr. M.C. Gifford	Auckland	New Zealand
314	Douglas Brand	London	England	339	Mr. J.C. Bemvenutti	Curitiba	Brazil
315	Robert Allen	Northampton	England	340	K.S. Raghuraman	Leiderforf	Netherlands
316	Mr. S.L. Du'Mmett	Gloucester	England	341	Georges Stoleru	Paris	France
317	Mrs. Joyce O'Reilly	London	England	342	Patrick N. Earle	London	England
318	Sue Whiting	Radlett	England	343	W. Akanbi	London	England
319	Jos J.J.W. Vos	Heerlen	Netherlands	344	Alan Boyd	Wadhurst	England
320	Klaus Hoffmann	Boeblingen	Germany	345	Angus Duncan	Aberdeen	Scotland
321	Mr. W.T. Docherty	Manchester	England	346	John A. Bather	Transvaal	S. Africa
322	Mrs. R. Pursell	Surbiton	England	347	Robert E. Morris	Bridgwater	England

THE GREATEST CHESS PLAYERS OF ALL TIME

Raymond Keene, OBE, explains the background to his book
Warriors of the Mind


Robert Fischer

Anatoly Karpov

In any competitive activity the new star becomes champion by beating the old champion. For those who remember the old champion in his prime, it is sad to see him forced to lower his colours or turn over his king. It is, however, intriguing to speculate on how the new star would have made out against the old champion suddenly turned young again and at his peak.

If we consider the world's greatest chess players, from 1850 when the German mathematics teacher Adolph Anderssen dominated the scene, to

1989 when the Russian bon vivant Gary Kasparov ruled the chess world, and if we bring them all to London (near the B.M. perhaps) each in the prime of his life, and let them have six months to read up on all that has developed in chess since they were young, how would they do playing against each other?

The main course of comparison is so-called expert opinion, and this is filled with backers for Botvinnik, supporters for Spassky, lovers for Lasker, favourites for Fischer. We were determined to bring order to this chaos. We carefully selected the top 64 players (from 1850 to 1987), we gathered over 10,000 individual results among these 64 superstars, we used statistics to construct the proper measures, calculus to maximize our chance of reaching the truth and computers to do the enormous number of calculations. Our first major problem was the generation gap. Since the old champions always lost to the new champions, there was a powerful, built-in bias in favour of the younger players. To overcome this, it was necessary somehow to use the actual birth dates of the players. Professor Harry Joe at the University of British Columbia found a statistically sound method of working in these birth dates and this brand new research will soon appear in *Applied Statistics*, published in England by the Royal Statistical Society.

The next difficulty was career span. Fischer stopped playing before he turned 30 and thus avoided the natural decline in his results. Smyslov, on the other hand, continues to play in the strongest tournaments and he is 68. We had to
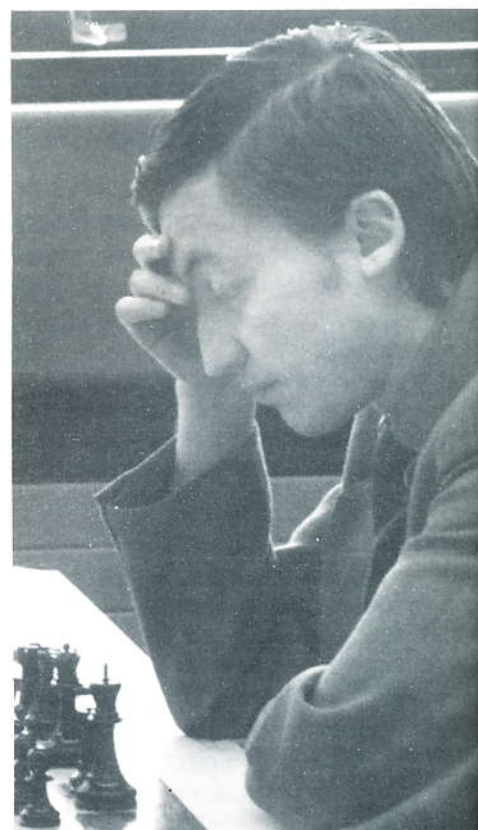
adjust each champion for the length and extent of his career.

The last hurdle was carefully to measure the strength of the opposition faced by each of our stars. Scoring 80% in the Chalfont St. Peter championship is not quite as good as scoring 50% in the championship of Moscow.

When the computer began to print out the final rankings, it was a little like tasting forbidden fruit. Who were the greatest? The long distance lines between Vancouver and London

Capablanca

must have given off steam. First came Kasparov, the current world champion, followed closely by Karpov and then Fischer. These were all young, alive and well. Were no oldtimers going to make the top ten? Fourth on the list was Botvinnik, world champion in the 1940s and '50s. Fifth was Capablanca, the genius of the 1920s. Sixth was Lasker, world champion in 1894. The birthdates had done their job! Seventh was Korchnoi – often a challenger but never world champion. Then followed Spassky, Smyslov, Petrosian and, in number 11, Paul Morphy, the leading player in 1858.

We were quite delighted until asked, where is Alekhine? Alekhine was 18th. We checked and double checked and, although this is unthinkable, it seems to be mathematically correct. Alekhine was a great player, a great annotator and a great promoter. His games are magnificent but his actual results against the very best

opposition are not all they might have been.

Since 1986 when we began this project, several new players have reached the top level. Jonathan Speelman has made enormous strides and will certainly be included in our next edition. Two young Russians: Valery Salov (born in 1964) and Vassily Ivanchuk (born in 1969) have great potential. And Judith Polgar (born in 1976) seems headed for the very top.

As time goes by, new superstars will appear and shoulder their way into the top ten. It seems that every 15 years or so, another Fischer, Karpov or Kasparov will appear. The top ten list in 2040 may well have three quite new names, but the old-time greats like Botvinnik, Capablanca and Lasker, greats that have already with-stood the test of time, will probably still be on the super-elite list.

Do today's players have more raw talent than the champions of the past? Perhaps not. There are, of course, many more Grandmasters today, and a young player must work much harder to reach the top than Capablanca did in 1910. Nevertheless, if Capablanca were born today, he would certainly reach the top again.

Another great spur to today's players is the large shadow being cast by computers. They are already nibbling on the heels of ageing grandmasters. In ten to twenty years, computers may well be playing for the world championship. Like the last Emperor of China, it will not be an enviable epitaph to be known as the last human chess champion of the world.

Botvinnik

Gary Kasparov

LETTERS
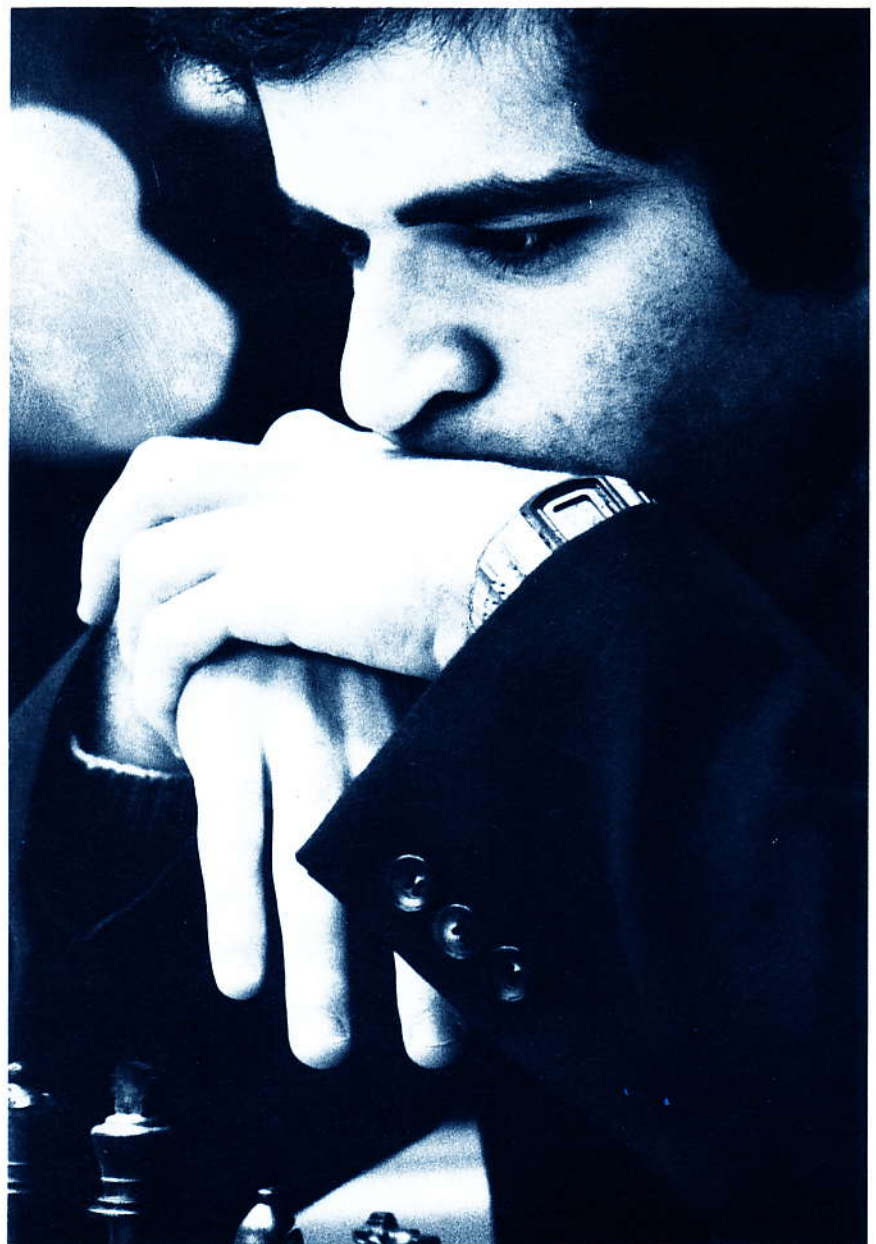
Dear Sir/Madam,

I have read with interest issue No. 2 of *Synapsia* and thought that other Brain Club members might be interested in a short verse I wrote on the topic of Thinking.

I am what I think

Thinking is about ideas and solutions, many of them, the more the better. It is about the impossible and not believing in it; all things are possible it is just time, evolution, and our imagination that limit our capabilities. Remember closed doors are not always locked and locks are there to be opened.

Thinking requires practice, commitment, and modesty. Practice makes perfect Commitment creates new horizons Modesty prevents fixed opinions. Thinking generates ideas and solutions of varying quality, do not discard, out of hand, poor quality thoughts for within them might be the seed of brilliance waiting to be germinated.

Another subject on which Brain Club members might wish to exercise their thoughts is the evolution of the brain itself. My own reasoning/thinking is as follows:-

1. If mankind evolved as Darwin and Wallace suggest, i.e. survival of the fittest, then each part of the body has or had a purpose and has at sometime been fully used.

2. If any organ/function had/has not been fully used then evolution would reduce its size/importance to meet the need.

3. If our brain has evolved in a similar manner then at some stage it should have been fully used by the majority of the species for it to have evolved further.

4. If our brain has been fully used in the past, at which evolutionary stage was this and what abilities required such enormous brain power.

If following this line of reasoning I accept that there are several possible false premises/restrictions:-

 – that man did not evolve
 – that the brain has never been fully used and evolution will over the passage of time reduce brain size to match needs
 – that the evolution is a long process
 – that our belief that only 5% of brain power is used is incorrect and should read 95%

It would be vain of me to assume that this line of reasoning is new and if it is not I would appreciate receiving details of reading matter. Alternatively other Brain Club members might have their own views on brain evolution and it would be interesting to hear of these.

Philip Carr (Member No. 188)
Gwent

Dear Sir/Madam,

I feel that I should sit and write this letter to you and let you know a little about myself. I am 45 years old, I received a secondary education at school. Although I haven't done too bad for myself in life I regret not spending the time and improving my general knowledge. I am very poor at mathematics, English and reading, although I intend to improve on these.

I am the only member in Northern Ireland. I am prepared to carry on by myself. I find your systems very interesting, I thoroughly enjoyed the little story on how to remember the planets – I never knew these. I have also learned the Link System, the Number Rhyme System, and I am well into the Major System, up to the 70s, although I find this difficult to put into practice. My reading ability at the moment is 170 words per minute. (Slow).

My general attitude to life is get up and go! I've built up a few businesses and it doesn't take much intelligence, just the goals that you see in front of you and go for it.

I've enjoyed writing this letter and I am enjoying studying the exercises. Now you know a little bit about myself. I will keep writing to you from time to time, maybe some day I will be able to start a Brain Club Cell over here.

Goodbye and God Bless.

Laurence Edgar (Member No. 254)
Belfast

Dear Sir/Madam,

First of all I would like to thank you for taking the time out to read my letter. It basically contains a question which I would dearly like to ask Tony Buzan.

In studying higher grade mathematics next year I will need to know a great deal of formula off by heart and their techniques of execution.

Please could you ask this question – it is extremely important for me to get this answer.

Yours desperately,

Michael Mannion, Brighton

The method you need was most brilliantly used by a Russian known as 'S'. See Amazing Memory Stories for a full explanation of how this is applied. *Ed.*

Dear Sir/Madam,

At the 'London Brain Club Conference', Tony Buzan was encouraging all members to get pen to paper and contribute to 'Synapsia'. After all, it's our magazine.

Well here's my contribution which I hope will inspire fellow members to also write in.

You may think all art is based on right brain activity, but have a look at M.C. Escher's work. Many of his drawings are pure genius, combining mathematical concepts with exquisite art, as the example demonstrates. The drawing is based on the Möbius strip (geometrical shape).

Studying this drawing will stimulate your whole brain. Why don't **you** pick up a book on Escher on your next visit to the library?!
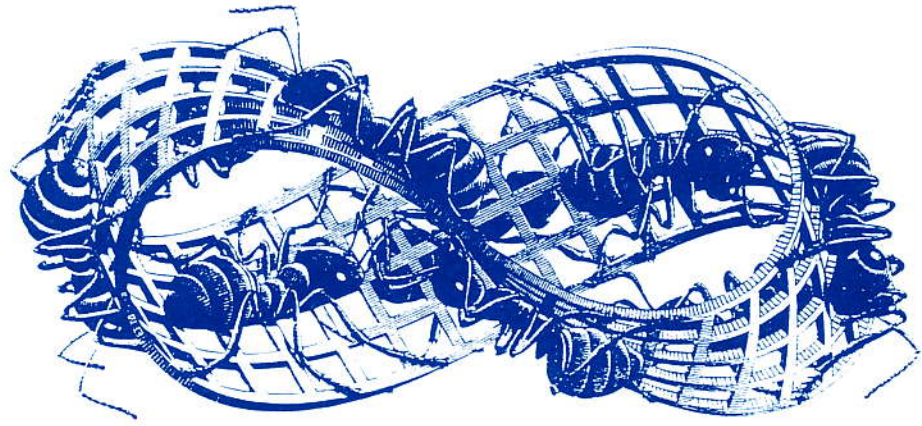
S. Rashid (Member No. 48)
Leicester

POETRY CORNER

MIRROR IMAGE

I look in the mirror
And what do I see?
A woman years older than me.
It must be my mother
Returned from the grave,
For I am much younger than she.

This woman is plumpish,
And I'm very thin.
Her eyebrows can scarcely be seen.
Her neck's full of wrinkles
– And mine is quite smooth –
What can this anomaly mean?

Did I enter a time warp
And speed years ahead?
And where have the years between fled?
If time goes that fast
For the rest of my life
Tomorrow I'll surely be dead!

Written by Jean M. Buzan in middle of night early 1990.

MENTAL WORLD RECORDS
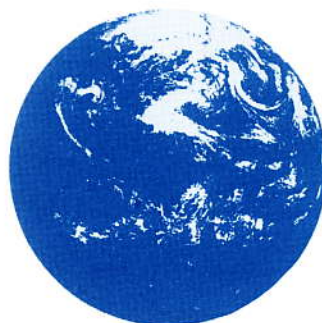
In the Summer issue of *Synapsia*, we introduced the current top ten chess players in the world, as well as the top ten players of all time as ranked by the international chess rating system (ELO).

In this issue Brain Club member Raymond Keene O.B.E. explains how he and Dr. Nathan Divinsky have given this matter much further thought, and have come up with a much more considered and 'fair' listing of the ten greatest chess players of all time.

For a full explanation of their considerations, see 'The Greatest Chess Players of All Time' by Raymond Keene in this issue of *Synapsia* page 22.

The new top ten listing is as follows:

TOP TEN CHESS PLAYERS OF ALL TIME (Keene/Divinsky)

Rank			
1	Gary Kasparov	3096	Russian
2	Anatoly Karpov	2876	Russian
3	Bobby Fischer	2690	American
4	Mikhael Botvinnik	2616	Russian
5	Jose Capablanca	2552	Cuban
6	Emanuel Lasker	2550	Russian
7	Victor Korchnoi	2535	Russian
8	Boris Spassky	2480	Russian
9	Vasily Smyslov	2413	Russian
10	Tigran Petrosian	2363	Russian

Intelligence Quotient

Who were the greatest historial IQ's?

The most in-depth work on this topic appears so far to have been done by C.M. Cox, who wrote in *Genetic Studies of Genius* (1923) about historical figures and their probable IQ's.

Cox had five different psychometricians estimate the IQ of the historical Great Brians on the basis of biographical data between their ages of 17 and 26. Cox then averaged the scores of the five psychometricians, and using his own psychometric and historical knowledge, presented an estimate of their most probable IQ's.

Following are the top 30 IQ's of all time, according to Cox:

TOP THIRTY IQ'S OF ALL TIME

Rank		
1	Goethe	210
2	Leibnitz	205
3-5	Newton	190
3-5	Pitt (the Younger)	190
6	Galileo	185
7-15	Leonardo da Vinci	180
7-15	John Stuart Mill	180
7-15	Hume	180
7-15	Erasmus	180
7-15	Descartes	180
7-15	Bacon	180
7-15	Charles Dickens	180
7-15	Milton	180
7-15	Michelangelo	180
16-19	Samuel Taylor Coleridge	175
16-19	J.Q. Adams	175
16-19	Emmanuel Kant	175
20-23	Alfred Lord Tennyson	170
20-23	Faraday	170
20-23	Handel	170
20-23	Raphael	170
24-29	William Wordsworth	165
24-29	Samuel Johnson	165
24-29	J.S. Bach	165
24-29	Benjamin Disraeli	165
24-29	Wolfgang Amadeus Mozart	165
24-29	Daniel Webster	165
30	Rembrandt	155

The scale by which Cox measured these IQ's would have the top 2% threshold (eligibility for entering MENSA) as an IQ score of 138.

In order to judge how frequently the all-time top scores would occur in the human population, the following table is provided:

150	1 out of 300
160	1 out of 3,000
170	1 out of 30,000
180	1 out of 100,000
190	1 out of 1,000,000
200	1 out of 10,000,000
210	1 out of 100,000,000
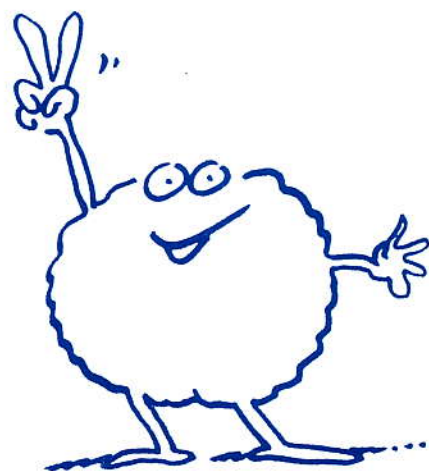
THE RECORDS SO FAR

In the last issue we established four world record holders:

Chess

The world record holder is:

> Gary Kasparov with a ranking of 2,800. (ELO)
> 3,096 (Keene/Davinsky)

Creativity

The world record holder is:

> Brain Club Member Tony Buzan, Fluency 249, Flexibility 94, Originality 368. Throughout the test Tony also achieved an originality score on the figural scale of 100%.

Intelligence Quotient

The world record holder in the two IQ categories of vocabulary and recognition and manipulation of similarities is:

> Brain Club Member Sean Adam (who also holds the current world Speed Reading record!) with Weschler scores of 152, translated into Catell scores of 180. These scores are the maximum available for the test

Numbers: the Memorisation of Pi

The world record holder is:

> Rajan Mahadevan who memorised thirty-one thousand eight hundred and eleven (31,811) digits of pi.

Speed Reading

The world record holder is:

> Brain Club Member Sean Adam with a reading speed of 3,850 words per minute.

Mental World Records

Who are the top ten brains on the Planet in each of the following mental skill areas:

1. Number memory
2. Card memory
3. Date memory
4. List memory
5. Book memory
6. IQ (intelligence quotient)
7. Creativity
8. Reading speed
9. TV quiz championships
10. Chess
11. Go
12. General knowledge
13. Mental calculation
14. Vocabulary
15. Mind Mapping

If you have any information in these areas, please send it to **Synapsia** care of the Editor.

Similarly, if you wish yourself to challenge for the top ten, do so, and send us your results.

Any suggestions for additional categories will be welcomed.

Synapsia looks forward to hearing from you.
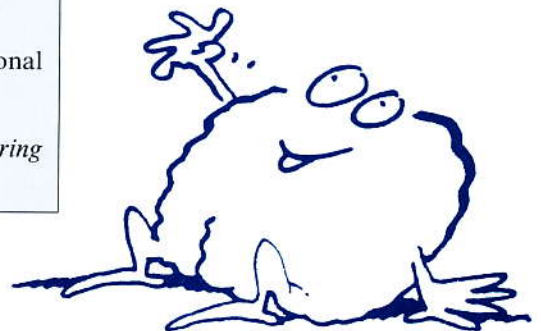
NEXT ISSUE

B. F. Skinner
More of this fascinating interview with the father of Behaviourism.

Could do Better! Can do Better!
The brain in schools.

An Elephantine Collection
World Memory Champions.

World Chess Championship
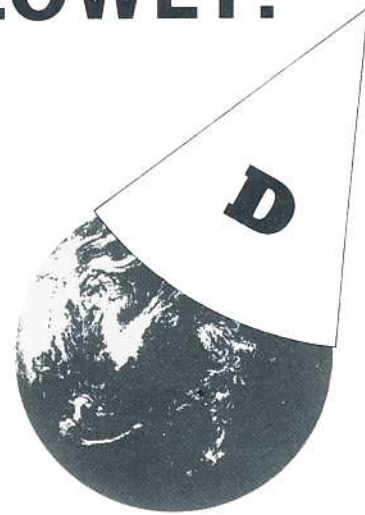Results and Analysis.

Graduation Day
Floating University Report.

WHY DOES THE PLANET LEARN SO SLOWLY?

by Sean Adam

Brain Club member and World Record Holder, Sean Adam, writes about learning how to read with much greater speed and comprehension.

In the words of Will and Ariel Durant in the introduction to their epic work, "The Lessons of History" – "*The* lesson of history is that men do not learn the lessons of history because they do not read the history books!"

That leaves the question – Why don't people read more? I have been puzzled by this question all my life – or more precisely, all my school life – and only now one half a century later have I found the answer.

It lies deeply buried in the subconscious mind of almost everyone. A very painful and embarrassing – even stomach-twisting-event that occurred in early childhood.

At some state, a teacher handed a very young student a book and told the student to read: Panic! Fear! Followed by feelings of inadequacy and loss of self-esteem – and there we have it. A real, life long deeply embedded trauma. A trauma of the worst kind – instilled by an authority figure and in full view of one's peers.

There is no worse problem for a ˈeuro-psychologist to handle.

Yet I have seen and treated such graduates who still cannot read – yes, they have "solved"/"conquered" all their sex/guilt/etc. problems – yet they still cannot read properly!

Why?

The problem is even deeper rooted than problems with sex! No kidding – the Learning Mechanism is even more important than the reproductive mechanism!!!

Heresy! All the Freuds/Jungs, etc., quickly roll over in their graves until I point out one singular fact – heretofore ignored: LEARNING is paramount to reproduction.

For if the newly born does not *LEARN* to survive (i.e. READ – the animal foot-prints, the weather, the moon, etc.), until the age of puberty, he will not be there to reproduce – much less to have a Freudian dream!

Therefore psychologists until today have started too late – they all assume it all starts with sex. No – it *Starts With Survival.*

How was this discovery made? By analyzing the problems encountered in attempting to teach adults to read properly.

As the world title holder of speed-reading for the past 5 years, I have been frequently asked to teach business executives and professionals how to increase their reading speed. The efforts had only limited success, which led me to analyse the success of popular and well known reading schools in America and in England.

They have experienced the same problem I encountered – a sharp increase in speed and comprehension while the student was in the course, followed within a few weeks or at most a few months by a return to the old speed. In short, the courses were and still are only of limited short term value for a majority of students. The ultimate proof lies in the facet that the schools do *not* grow! Hamburger stands and muffler shops proliferate faster than reading schools. The correctness of the techniques being taught are not at question. We have known for over 50 years that the eye can switch focus in less than 1/500 of a second – that the focal width of each eye focus at a normal reading distance of 18" is approximately 18 characters or 3 words. Therefore, the human eye is capable of reading 1,500 words per second or 90,000 words per minute, yet the average reading speed is less than 200 words per minute. What happened to the other 89,800 words per minute?

They got lost when we were taught to read – aloud – with our *tongues* instead of our *eyes and brain*!

So why can't a person simply learn a new technique and start using it? Because the subconscious mind will not accept a new technique until it has agreed to give up the old one.

For example – imagine a large pet dog over in the corner chewing on a bone – suddenly the owner realizes the bone is very old and dry and, therefore, actually dangerous for the dog as old bones splinter and can choke the dog. What can the owner do? He can't run over and take the old bone away, otherwise the dog may get a new bone – the owner's arm! The best path is to offer the dog a new more attractive alternative and to get the dog's agreement to drop the old bone. *Give it a steak* and *at the same time* remove the old bone.

The last bit is what has been missing in teaching speed reading. The student has been offered the new steak; however, the old reading routines which have been so deeply embedded have not been simultaneously removed.

Why not? Because (1) the reading teachers did not realize it was a required step and (2) even if they did, they did not know how to remove the old routine.

Only over the past 9 months have new techniques combining motivational psychology, teaching skills and regression hypnosis utilizing the Alpha state been developed and combined to allow easy removal of the old routine.

The new system works!! Tested on professionals in the USA and the UK, it achieves an increase of 50% to 200% within 3-6 hours of instruction and most importantly, the speed and comprehension keep increasing month after month with no further instruction required.

How is such a transformation achieved? By hypnotizing the subject to a 5-8 Hertz brain wave state (commonly referred to as the Alpha state) and then regressing the subject back to the time – usually 4-6 years old – when he/she was first taught to read. Then the entire original learning experience can be re-lived – with all the pain and tears – and laid to rest. Once and for all!

After this, the new techniques can be installed. The process is much more complex than the brief paragraph above can describe as it takes 3-6 hours depending on the severity of the original trauma. The good news is that the most difficult cases to date have been cured in 6 hours and resulted in a 200% improvement in speed and comprehension. The easiest case to date took 20 minutes and resulted in a reading speed increase of 500% (150w/m to 750 w/m).

The author – Sean Adam – began his studies in motivational psychology in 1957, and after having his name engraved on a brass plaque in two major American universities for his academic excellence, specialised in industrial and marketing psychology for 5 years and then embarked on a lengthy world tour of over 100 countries. He studied the religious, psychological and economic systems of the planet in detail and then rested for a few years to consolidate his thoughts and to write.
An acknowledged expert in learning systems and holder of several world records in intellectual achievement he now resides on intercontinental aircraft and lectures to a growing list of international clients.
He has recently, for example, taught the Training Directors of the top 120 European companies how to use Alpha Learning in their own corporate environments.
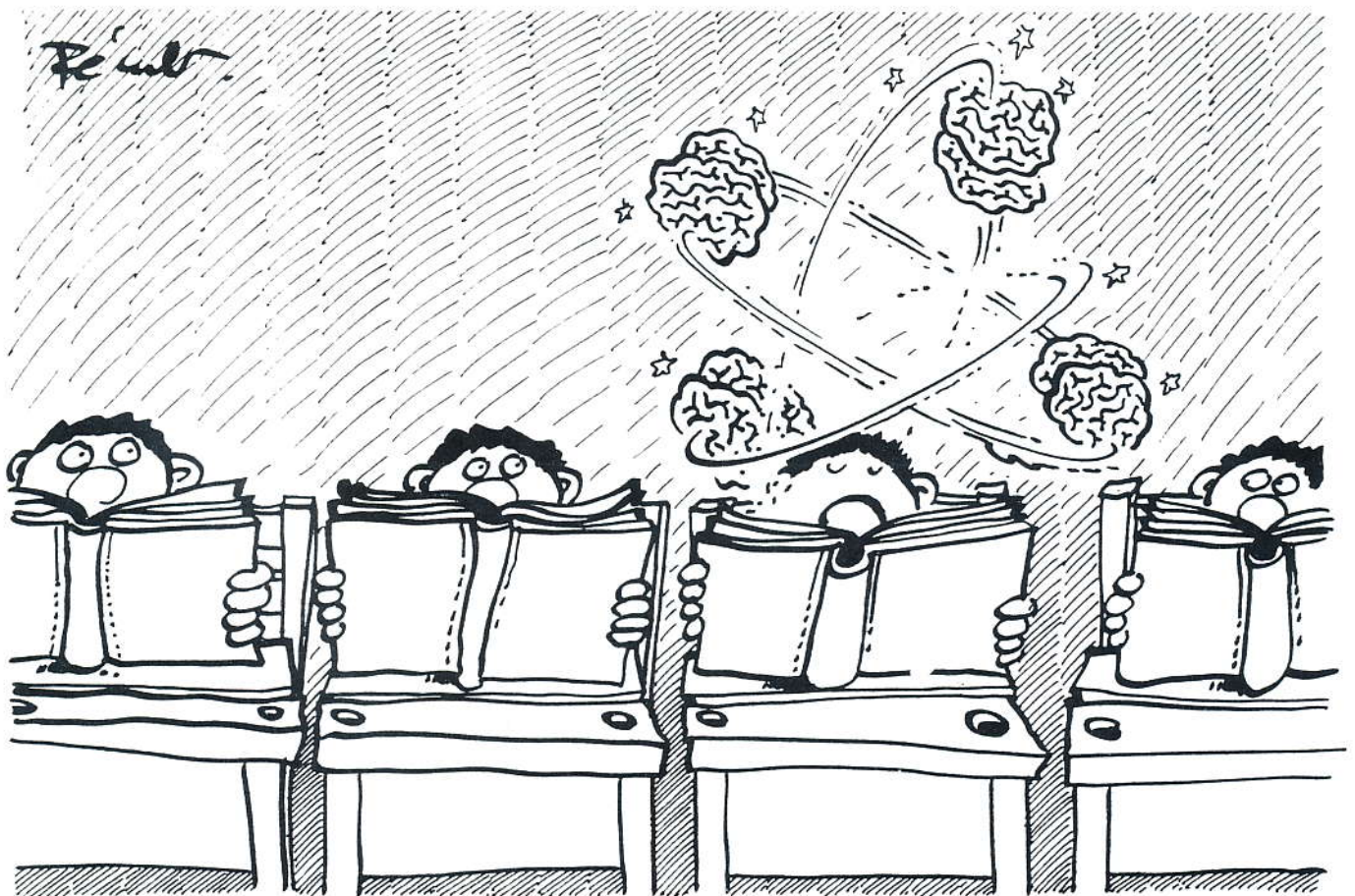
THE IONIAN

A delightful book on the development of intelligence is *The Day The Universe Changed* by James Burke (BBC Publications). The book is lushly illustrated and gives a pleasant tour through an age that gave rise to the birth of intelligence.

We reprint a succinct and entertaining little essay on memory to give readers of *Synapsia* some delicious titbits of information and a taste for this entertaining and stimulating book:

In a world where few could read or write, a good memory was essential. It is for this reason that rhyme, a useful *aide-mémoire,* was the prevalent form of literature at the time. Up to the fourteenth century almost everything except legal documents was written in rhyme. French merchants used a poem made up of 137 rhyming couplets which contained all the rules of commercial arithmetic.

Given the cost of writing materials, a trained memory was a necessity for the scholar as much as for the merchant. For more specific tasks than day to day recall, medieval professionals used a learning aid which had originally been composed in late classical times. Its use was limited to scholars, who learned how to apply it as part of their training in the seven liberal arts, where memorising was taught under the rubric of rhetoric. The text they learned from was called *Ad Herennium,* the major mnemonic reference work of the Middle Ages. It provided a technique for recalling vast quantities of material by means of the use of *'memory theatres'.*

The material to be memorised was supposed to be conceived of as a familiar location. This could take the form of all or part of a building: an arch, a corner, an entrance hall, and so on. The location was also supposed to satisfy certain criteria. The interior was to be made up of different elements, easily recognised one from the other. If the building were too big, accuracy of recall would suffer.
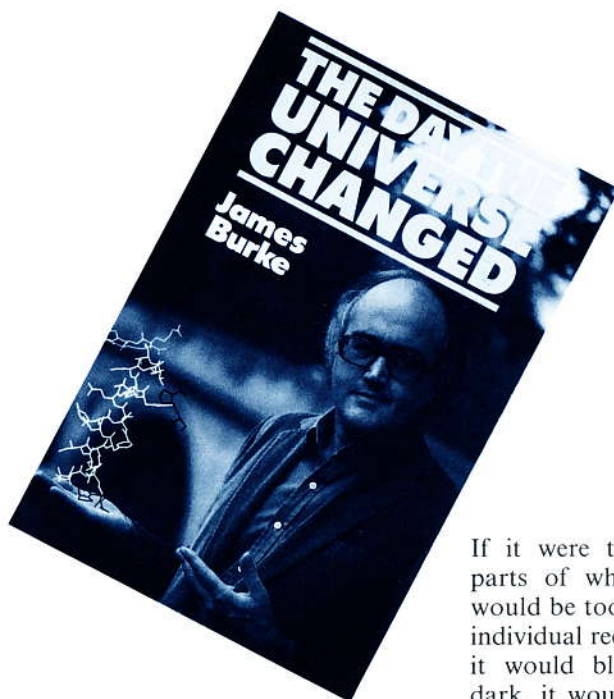
If it were too small, the separate parts of what was to be recalled would be too close to each other for individual recall. If it were too bright it would blind the memory. Too dark, it would obscure the material to be remembered.

Each separate part of the location was to be thought of as being about three feet apart, so as to keep each major segment of the material isolated from the others. Once the memory theatre was prepared in this way, the process of memorising would involve the memoriser in a mental walk through the building. The route should be one which was logical and habitual, so that it might be easily and naturally recalled. The theatre was now ready to be fitted with the material to be memorised.

This material took the form of mental images representing the different elements to be recalled. *Ad Herrenium* advised that strong images were the best, so reasons should be found to make the data stand out. The images should be funny, or bloody, or gaudy, ornamented, unusual, and so on.

These images were to act as *'agents' of memory* and each image would trigger recall of several components of the material. The individual elements to be recalled should be imaged according to the kind of material. If a legal argument were being memorised, a dramatic scene might be appropriate. At the relevant point in the journey through the memory theatre, this scene would be
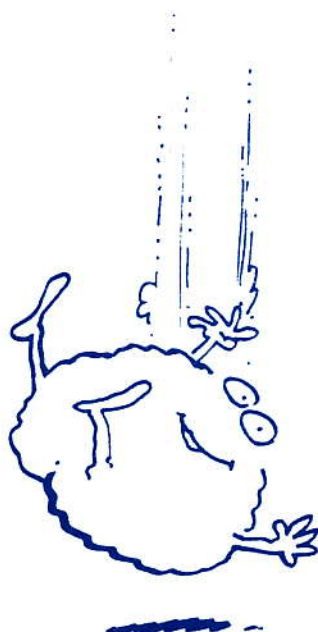
triggered and played out, reminding the memoriser of the points to be recalled. The stored images could also relate to individual words, strings of words or entire arguments. *Onomatopoeia,* the use of words that sound like the action they describe, was particularly helpful in this regard.

The great medieval theologian St Thomas Aquinas particularly recommended the theatrical use of imagery for the recall of religious matters. *'All knowledge has its origins in sensation,'* he said. The truth was accessible through visual aids. Especially in the twelfth and thirteenth centuries the influx of new Greek and Arab knowledge, both scientific and general, made memorisation by scholars and professionals more necessary than ever.

As painting and sculpture began to appear in churches the same techniques for recall were applied. Church imagery took on the form of memory agent. In Giotto's paintings of 1306 on the interior of the Arena Chapel in Padua the entire series of images is structured as a memory theatre. Each Bible story illustrated is told through the medium of a figure or group in a separate place, made more memorable by the use of the recently developed artistic illusion of depth. Each image is separated by about thirty feet, and all are carefully painted to achieve maximum clarity and simplicity. The chapel is *a mnemonic path to salvation.*

In the frescoes of S. Maria Novella in Florence the order of seven arts, seven virtues, seven sins, is depicted. In the painting of the four cardinal virtues, additional memory cues are provided. The figure of Prudence holds a circle (representing time) in which are written the eight parts of the virtue. Putting together the images, the layout, and the use of lettering, it was thus possible to derive an entire system of knowledge from one mnemonic fresco. *Cathedrals* became enormous *memory theatres* built to aid the worshippers to recall the details of heaven and hell.

Mnemonics were also used by the growing university population. All lectures were read from a set text to which teachers added their glosses, or comments. Many of the instructions to students took the form of mnemonic lists and abbreviations for use when the time came for examinations.

For those who were rich enough to be familiar with written manuscripts, there was a difference between reading and writing which has since disappeared. A member of a noble family would have in his household at least one person who could read and another who could write. Letters were almost never read by the recipient, but by these servants. Moreover, a servant who could read would not necessarily be able to write. As will be seen, writing was a separate art requiring much more than simple knowledge of the shape of letters.
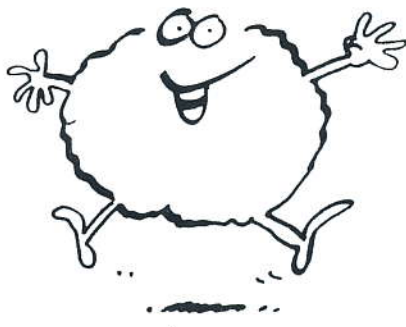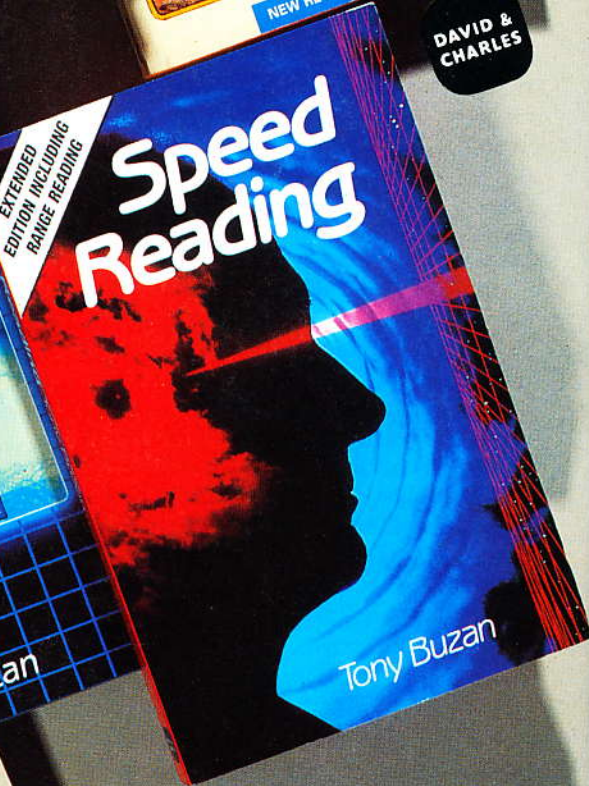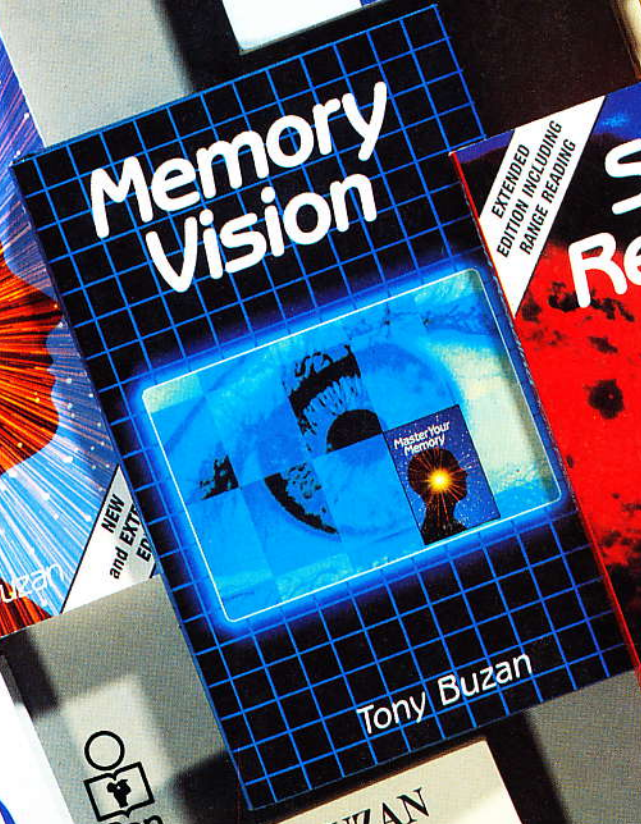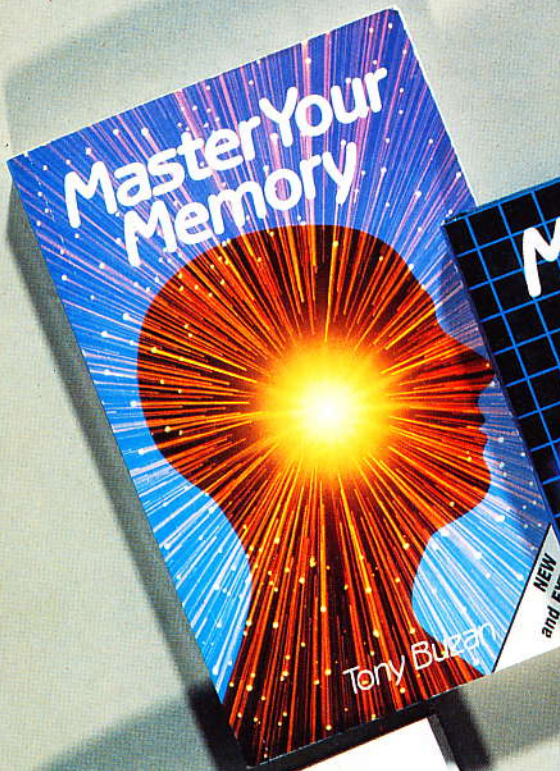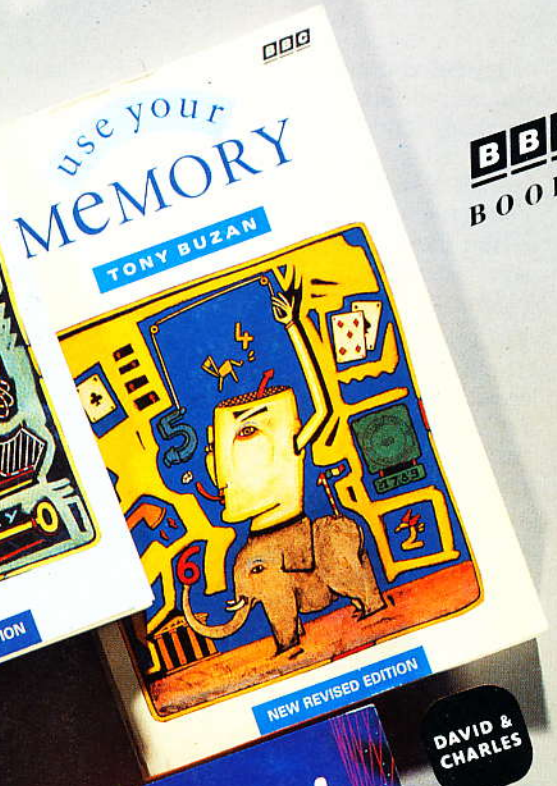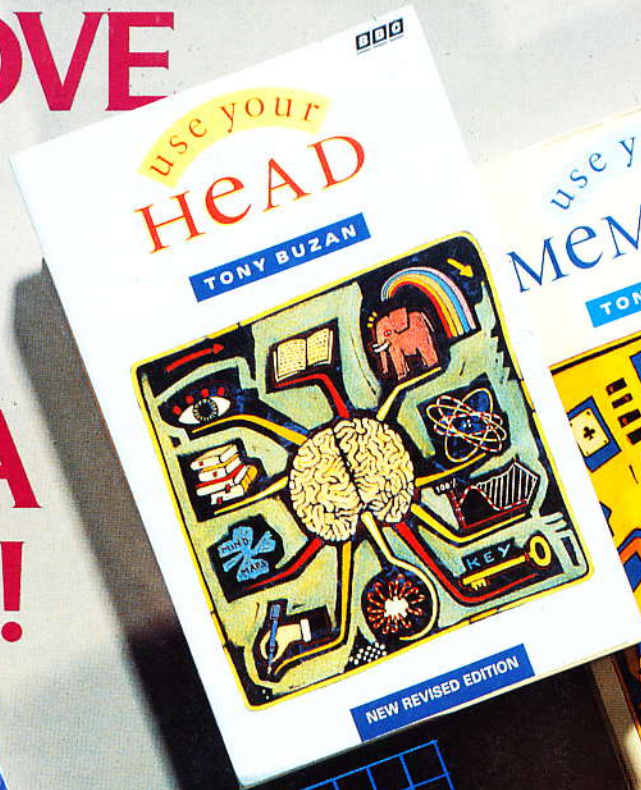
Our modern word 'auditing' comes from this practice of hearing, for accounts would be read aloud to those concerned. Abbot Samson of Bury St Edmunds heard his accounts once a week. Pope Innocent III could read, but always had letters read aloud to him. It was this habit which explains the presence in the text of warnings such as, 'Do not read this in the presence of others as it is secret.' In fact, those who could read silently were regarded with some awe. St Augustine, speaking in the fifth century about St Ambrose, said: '. . . a remarkable thing . . . when he was reading his eye glided over the pages and his heart sensed out the sens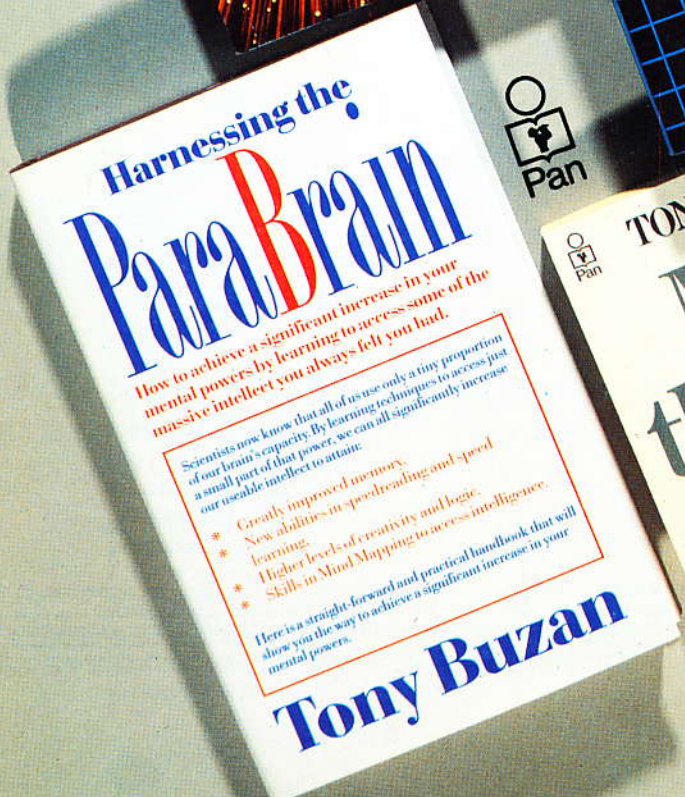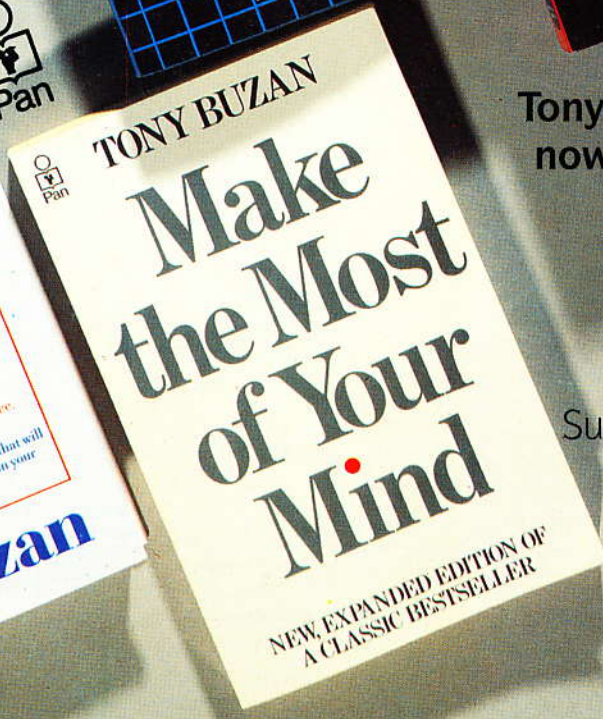e, but his voice and tongue were at rest.'