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SYNAPPSIA

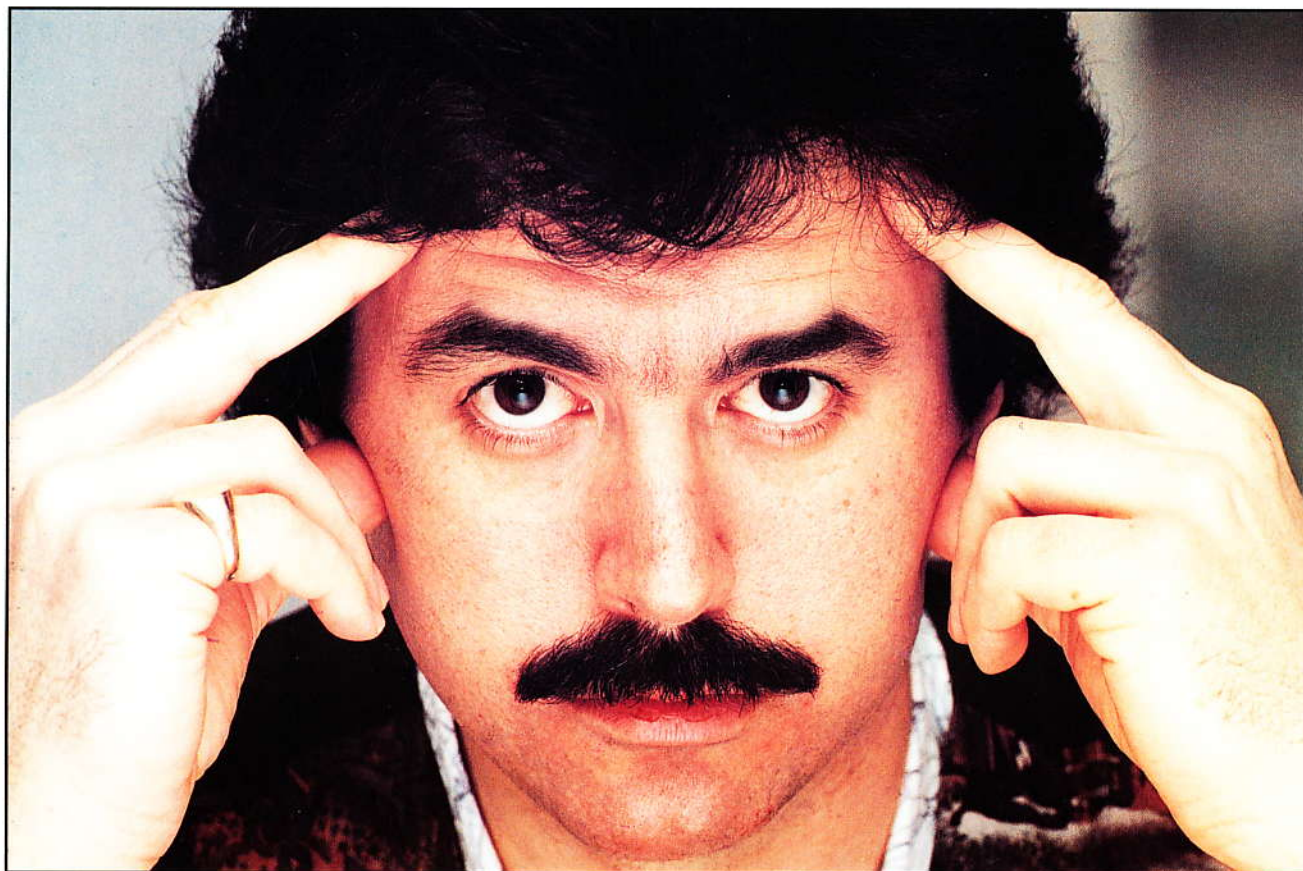
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Summer 1993

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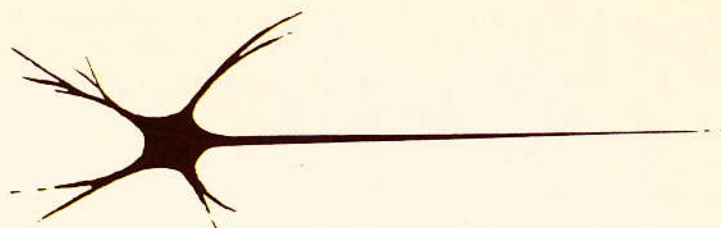


Dominic O'Brien – World Memory Champion

Remember this man's face – he won't forget yours

In this issue

- **Memoriad '93: A Memorable Event** •
- **Remembrance of Things Unconscious** •
- **Fermat's Theorem: Proof or Guesswork?** •
- **History of the World Chess Championship** •



SYNAPSIA EDITORIAL

Future Perfect

I would like to use this editorial to outline to readers our plans for *Synapsia* over approximately the next 18 months. We are very keen to make the magazine more interactive and to encourage contributions from readers and members of The Brain Club. With this in mind, and to give the magazine a more coherent structure, from now on each issue will have a theme. This will give potential contributors plenty of time to map out any material they wish to forward in connection with the various topics. This issue, taking advantage of the recent *Memoriad*, we have taken memory as our theme. The themes planned for future issues (along with publication dates) are as follows:

Autumn/Winter 1993 (double issue)

Babies 15/12/93

Spring 1994

Sport 15/03/94

Summer 1994

Animal Intelligence 15/06/94

Autumn 1994

Mental World Records 15/09/94

Winter 1994

Games 15/12/94

The double issue at the end of the current year will enable us to get up to date and from then we will be publishing regularly at three-monthly intervals, with a view to progressing to six issues per year and, eventually, to making *Synapsia* a monthly production.

The publication dates for the magazine are given above. Contributions for these should reach me six weeks prior to these dates for the material to be included in that issue.

We want *Synapsia* to be an interactive magazine. Its main function is to run articles that will hopefully prove to be of interest to Brain Club Members. The secondary function is to act a conduit for the exchange of information and ideas between

members. So, if you have anything you want to say about any of the above topics or, indeed, anything else, do get pen to paper. There are many regular features (e.g. book reviews, top ten books, letters page etc.) that are ideal for contributions and we are also, of course, always delighted to consider new suggestions.

The editor welcomes contributions to *Synapsia*. Please contact him at: 23 Ditchling Rise, Brighton, Sussex BN1 4QL.

THE BRAIN CLUB CHARTER

The Brain Club was incorporated on 15 May 1989, and became a registered charity on 23 November 1990. Its official charter states the Club's formal purposes:

- A. To promote research into the study of thought processes, and into the investigation of the mechanics of thinking as manifested in learning, understanding, communication, problem-solving, creativity and decision-making.
- B. To disseminate the results of such research and study.
- C. To promote generally education and training in cognitive processes and techniques.
- D. To develop and exploit new techniques in cognitive processes.



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No 2 Summer 1993

Editor-in-Chief
Tony Buzan

Executive Editor
Byron Jacobs

Editorial Consultant
Andrew Kinsman

Editorial Board
Vanda North
Ray Keene OBE
Sir Brian Tovey KCMG
Lady Mary Tovey

Cartoonist
Pécub

Published by
The Buzan Organisation Ltd
The Harleyford Manor Estate
Marlow
Buckinghamshire SL7 2DX
Tel: (0628) 482765
(inside UK)
+44 628 482765
(outside UK)

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The term and concept Mind Map referred to in this publication is a trademark.

Pécub, the world's fastest brain cartoonist, is happy to provide cartoons based on your ideas and requests.

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Look Ahead!

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It has been written that the mental and physical preparation required to compete successfully in a World Chess Championship Final makes a boxing match such as Ali - Frazier seem like a quiet chat in comparison. With Kasparov - Short in full swing in London, Raymond Keene takes a look at previous mental battles at this rarefied level.

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SYNAPTIC FLASHES

Brain News

A 'wet' weekend in New York

In the last issue of *Synapsia* we reported the extraordinary exploits of 15-year-old Alan Saldanha, who became the youngest-ever British Scrabble Champion. As we went to press Alan was about to compete in the World Championships at the Plaza Hotel in New York as part of a 14-strong team from Britain and Ireland. After an exciting and exhausting weekend Alan was placed a very creditable fifth, the title being lifted by a 26-year-old television producer from Leeds, Mark Nyman. Mark, who is the brains behind the popular Channel 4 word quiz series *Countdown*, fought back from two games down in the best-of-five final against Canadian Joel Wapnick using words such as 'Dojo', a judo hall, and 'quint', a sequence of five cards in piquet; the winning word was the simple 'wet'.

Schools Chess

The final of the 1992-93 *The Times* British Schools Chess Championship ended in a thrilling victory for Truro School over Haberdashers' Aske's by 3.5 to 2.5. Truro, whose most famous recent ex-pupil is the British No 2, Grandmaster Michael Adams, now holds the remarkable record of reaching the last four in all but one of the past five years. For Haberdashers', it was a valiant effort on their first appearance in the final stages. In the play-off for third place Manchester Grammar School defeated Royal Grammar School, Newcastle, 4-2. The new Brain Trust Order of Merit will appear in the next issue of *Synapsia*.

Rewriting the Textbook

The recently published *Simply Algebra* is a maths textbook with a difference: it was written by an 11-year-old. Rosalind Selfe's guide is designed to put the fun back into simultaneous equations, indices and basic principles, and she is already planning a follow-up on co-ordinate geometry. Having been educated by her parents at home over the last few years, Rosalind has just re-entered the education system on a scholarship at an independent school near her home in Emsworth in Hampshire.

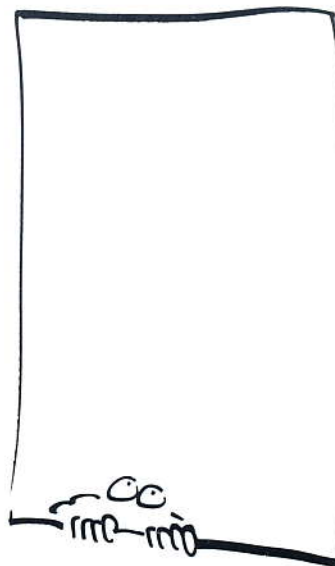
Red Hot Chile Performances

Benjamin Zander (BCM 500) has just completed a successful tour of Chile with the acclaimed Boston Youth Philharmonic Orchestra. The orchestra, which consists of young musicians between the ages of 13 and 18, delighted audiences with a series of concerts that would bear comparison with most professional orchestras: 'This extremely talented young group creates sparks and transmits to the audience both the spirit and the essence of the music which they perform' (*El Mercurio*). Benjamin himself, as Artistic Director and conductor, was singled out: 'His conducting is masterly, clear and fully expressive, establishing him instantly as an important leader' (*La Epoca*).

The 5000 Steps to Genius

According to Professor John Sloboda, a psychologist at the University of Keele, mastery of a musical instrument does not require any inherent gift, and is within the grasp of most of us. Professor Sloboda studied 120 pupils learning musical instruments at a Manchester school and concluded that the most successful carried out the required practice, were encouraged in their early efforts by supportive parents, and were instilled with enthusiasm by their teachers. Sloboda says 5000 hours of practice are necessary to achieve entrance to music school (the best students had practised for 10000), but a level of competence can be achieved after 1000-2000 hours.

Sloboda claims, 'Many people believe that musicians are born not made: that there is some inherited gift that sets a small number of people apart from birth and destines them for musical excellence. The scientific evidence for such beliefs is much less secure than might be thought. The vast majority of the population possesses the inherited characteristics needed to perform music well, and differences in accomplishment are mainly due to differences in experience, opportunity and motivation. I don't know that all of us could be Nigel Kennedy, but most of us have much more musical capacity than we believe. Even Mozart had to put in the hours.'



A MEMORABLE WEEKEND

Dominic O'Brien retains the World Memory Championship.

Memoriad II - Dominic Returns

The second Memoriad, held at Simpson's-in-the-Strand over the weekend of 7-8 August, resulted in a tremendous success for dominant Dominic O'Brien, who finished first in seven out of the ten gruelling events and retained the overall title of World Memory Champion which he had won in the inaugural contest in 1991.

This year's competition was made up of ten events of differing durations (analogous to sprints, middle distance and marathon runs), to arrive at an overall memory

'decathlon'. Dominic proved himself to be untouchable in all fields and ran out a worthy champion.

His outstanding feats included the memorisation of eight packs of playing cards in one hour, the memorisation of 1002 binary digits in half an hour and, perhaps most impressively of all, the creation a new world record by remembering 100 numbers which were read out at two second intervals. He did this not once, but twice, making no mistakes.

Poet Laureate Ted Hughes created a new text, Anamnemonicker (see Poetry

The prize – the Seredrin Ginkgo Biloba Award donated by David Wilkie's company, Health Perception.





Mr Brian Clivaz, general manager of Simpson's, opens the proceedings.

Corner), for the competitors to memorise and 21-year-old Oxford University student Jonathan Hancock won this event by memorising 12 lines with punctuation perfectly in 15 minutes.

Prizes for the event included the complete set of the *Encyclopaedia Britannica* and a bronze elephant donated by Seredrin on behalf of Olympic swimmer David Wilkie. The Brain Trust also announced a £2000 donation to sponsor research into the memory of the elephant.

Media interest in the event was extremely high. Film crews included the BBC for *Tomorrow's World*, the BBC for *The Unforgettable Memory Show*, London Tonight and Sky News. Radio coverage was obtained on LBC and Classic FM. There was also a mass of newspaper coverage in most of the national dailies, with sizeable spreads in the *Independent*, the *Daily Telegraph*, *The Times*, and the *Guardian*, the latter pair carrying a good shot of a photogenic Dominic posing with a pack of playing cards.

Record Breakers

A number of remarkable feats and new world records were witnessed over the weekend:

Event 1

The first of the marathon events. Dominic's score of 900 digits remembered in one hour was remarkable and constitutes a new world record.

Event 2

In this round Jonathan Hancock established himself as a formidable contender for the title with a 100% score on the *continued overleaf*



The competitors and organising team. Left to right: Tom Morton, Natasha Diot, Alastair Levy, Jonathan Hancock, Dominic O'Brien, Ken Wilshire, Philip Bond, Tony Buzan and James Lee.

MEMORIAD '93

The Events

- 1 Memorisation of a 2000 digit number (1 hour)**
 Contestants recall this number by writing it down. The arbiter then checks this number against the original, with digits being ticked or crossed accordingly. At the end of each line of forty digits a note is made of how many mistakes there were in the line. No mistakes scores 40 points, one mistake scores 20 points and more than one mistake scores zero points. The line scores are totalled for an overall result.
- 2 Memorisation of 100 names and faces (15 minutes)**
 Faces are presented to the contestants in a certain order with corresponding names underneath. They are then presented in a new order without names. Contestants mark names on the new sheets, and score one point for each name correctly recalled.
- 3 Memorisation of a list of 500 words (15 minutes)**
 Words are presented in columns of fifty and numbered. Contestants need to recall words in sequence by writing them down. The columns are scored as follows: no mistakes scores 50 points, one mistake scores 25 points and more than one mistake scores zero points. The column scores are totalled for an overall result.
- 4 Memorisation of a 100 digit number spoken aloud, at two-second intervals**
 Contestants recall this number by writing it down. The score is considered as the number of digits correctly recalled before a mistake is made. The procedure is repeated three times, only the best score counting.
- 5 Memorisation of 12 packs of cards (1 hour)**
 Contestants are given one hour to memorise as many of 12 packs of cards as they can. No mistakes in a pack of cards scores 52 points, one mistake scores 26 points and more than one mistake scores zero points. The scores for the individual packs are totalled for an overall result.
- 6 Speed memorisation of a 200 digit number (5 minutes)**
 Contestants recall this number by writing it down. The scoring system is as for competition 1.
- 7 Memorisation of paintings and images (20 minutes)**
 Contestants are given 24 images which they have to memorise. They are then given a further 100 images of which the original 24 are a part. As each image is presented, the contestants are asked to note whether or not this image has been presented previously. They receive one mark for getting this correct. They receive an extra mark if they can note whether this image has been presented the same way round as previously, or opposite.
- 8 Memorisation of unknown text (15 minutes)**
 Contestants are given 40 lines of text to memorise. They then recall this text by writing it down, including punctuation. If a contestant makes any error in a line, that line is scored as zero. A perfect line scores one point.
- 9 Memorisation of a 2000 digit binary number (1 hour)**
 Rules as for competition 1.
- 10 Speed memorisation of a shuffled pack of cards**
 Contestants are handed a shuffled pack of cards by the arbiter. Stopwatches are set to zero and started in synchrony. When contestants have finished memorising the pack they raise their hand and the watch is stopped. Contestants score only as much of the pack as they correctly recall, e.g. remembering 25 cards using the entire five minutes scores higher than attempting to remembering the whole pack in one minute, but failing on the 25th card and thus scoring only 24.

MEMORIAD '93

Competition by Competition Results

	1		2		3		4		5		6		7		8		9		10	
	2000 digits		100 names		500 words		100 digits		12 packs		200 digits		images		text		2000 binary		speed cards	
1 Dominic	900	1	74	4	125	1	100	1	416	1	132	1	16	3=	6	6	1002	1	2.00	1
2 Jonathan	160	5	100	1	114	2	35	2	312	2	17	8	15.5	5	12	1	200	3	3.09	2
3 Philip	460	2	43.5	9	49	9	16	4	104	3=	75	2	16	6=	7	4=	600	2	24	5
4 Creighton	360	3	83.5	3	86.5	4	11	5=	104	3=	19	7	18	1	3	7=		8	3.49	3
5 Alastair	120	6	86	2	42	10	7	8	53	6	36	5	17	2	9	3	162	6	13	7
6 Ken	110	7	45.5	7	48.5	8	23	3	0	7=	57	3=	14.5	8	7	4=	185	5	12	8
7 Tom	320	4	62.5	6	87	3	8	7	0	7=	57	3=	9	9	3	7=		7	17	6
8 Natasha	90	8	45	8	74	5	11	5=	78	5	30	6	15	6=	10	2	64	9	11	9

In the crosstable, the first score is the contestant's score in the event. The second indicates their placing in that event.

Grand Totals - The Final Standings

Dominic O'Brien (92.5)

The reigning World Memory Champion, holder of the World Speed Card Memorisation record (55.4 seconds!) and television personality.

Jonathan Hancock (80.5)

Oxford University student and second in Memoriad '91. Jonathan has recently blazed his way through a series of psychological memory tests.

Philip Bond (67.5)

Mathematician, financial analyst and mentathlete. World's leading 'number matricist' and challenger for the English and World titles in the memorisation of Pi.

Creighton Carvello (66)

World Record holder in six-pack memorisation and English National Record holder for the memorisation of the number of digits of Pi (20000). Internationally

renowned 'memory performer' on radio and TV.

Alastair Levy (60)

14-year-old son of David Levy, the well-known organiser of the Computer Olympics. Junior champion.

Ken Wilshire (54.5)

Employed with Chemical Bank of New York in London.

Tom Morton (53.5)

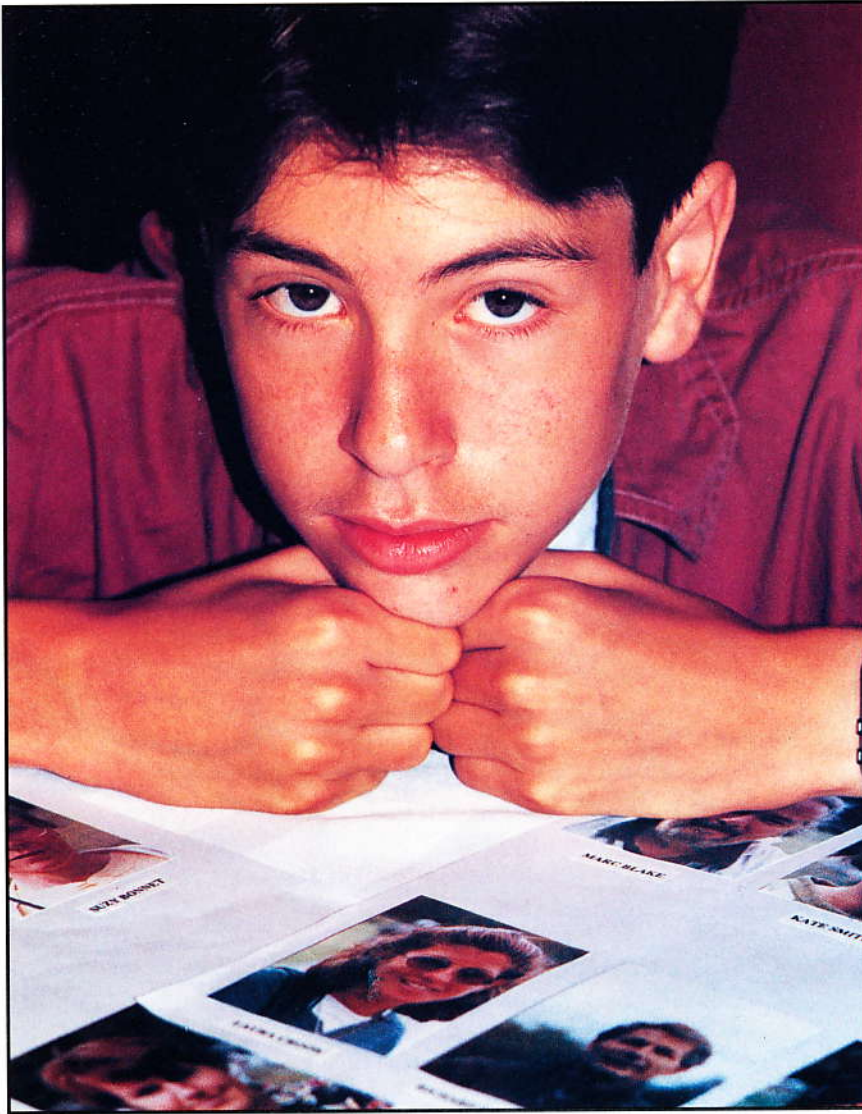
Phone numbers memory man from Blackpool.

Natasha Diot (50.5)

16-year-old schoolgirl from Sunbury. Ladies World Champion.

Other competitors for specific competitions: Sue Whiting, Vanda North, Helen Whitton, Sophie Holt, Doug Fulton, James Longworth and James Lee.

Each event scored 10 points for the winner, 9 for the competitor placed second, 8 for the third etc. Each competitor's total is given in brackets after his or her name.



World Junior Champion Alastair Levy.

memorisation of names and faces. 14-year-old Alastair Levy finished an outstanding second, with Dominic forced back into fourth place.

Event 3

On the word memorisation test Dominic and Jonathan were extremely evenly matched, with Dominic just coming through by 11 words.

Event 4

Although Dominic achieved many remarkable feats in the course of the weekend, this was the most impressive. When this event had been created, it was viewed as a mental Everest to be climbed by the year 2000 – the mental equivalent of the three-minute mile. To put the result in some kind of perspective it is worth noting that at the end of the nineteenth century, the best score achieved was 17. The previous world record, and this was achieved by someone who had practiced hard for many years, was 83. To score 100, twice, under the pressure of open competition, is really something special.

At the end of the weekend, when the prizes had been awarded and large amounts of food and wine consumed, the BBC wanted to do some filming and requested the competitors reassemble themselves to do some takes. When everything had been set up, this event was reconstructed, with the competitors pretending to be concentrating on memorising the number which was being spoken aloud. However, they were not all pretending! Dominic, even after his exertions over the weekend and the recent buffet, correctly recalled 104 digits, thus exceeding his previous score! When Everest had been conquered mountaineers set themselves the target of climbing it without oxygen. Perhaps Dominic's next



Tom Morton with television personality Creighton Carvello.



target will be to correctly recall 100 digits underwater!

Event 5

Dominic's score of eight packs memorised correctly, in this, the second of the marathon events, was a further new world record, but mention should also go to Jonathan Hancock, who achieved the excellent score of six packs. Jonathan is a previous record holder in this event: in 1988 he memorised six packs. However, this was with unlimited time and, in his recall, he made five mistakes. Here, as with the speed memorisation of event four, new heights have clearly been scaled.

Event 6

The first sprint event resulted in a further clear first for Dominic, with Philip Bond achieving a very creditable second.

Event 7

For only the second time in the weekend so far, Dominic failed to win the event; he was placed third behind Creighton Carvello and young Alastair Levy.

Event 8

No new records were set here, but the winner was clearly Poet Laureate Ted Hughes, whose poem, Anamnonicker (see Poetry Corner), had the competitors struggling. The poem was 'written

to be forgotten,' and also to 'have the appearance of being useless, but actually being useful once one had deciphered it.'

Event 9

The final marathon, resulting again in a new world record and another first for dominant Dominic.

Event 10

A final sprint event and it's that man again! Although 2.00 is some way outside Dominic's record of 55 seconds, this was achieved at the end of a long weekend and in open competition, where any mistakes could prove very costly. This was also the event that first inspired Dominic to start training his memory when he watched Creighton Carvello performing this feat on Record Breakers a few years back.

The competitors in action.

World Memory Champion Dominic O'Brien receiving his prize.



REMEMBRANCE OF THINGS UNCONSCIOUS

Traditional ideas about memory are being challenged by the discovery that much of what we retrieve may be hidden from conscious awareness, writes David Shanks.

He describes how no sooner had he tasted the cake 'than a shudder ran through me and I stopped, intent upon the extraordinary thing that was happening to me. An exquisite pleasure had invaded my senses, something isolated, detached, with no suggestion of its origin.'

The Greatest Mysteries

Memory and consciousness are among the greatest mysteries of the mind. How is it that we can consciously recollect events that have happened to us in the past? Many people have been tempted to compare human memory with the memory storage devices of computers, and this analogy has indeed proved beneficial in the understanding of certain aspects of memory. But while computers, like people, can retrieve information, they do not have any of the curious feelings or experiences that memory gives us.

Consider some of these experiences: everybody has had the feeling of *déjà vu*, where we have a strong sensation that something we are actually experiencing for the first time is familiar. Or consider the 'tip-of-the-tongue' phenomenon when we know that a word or name is stored in our memory, but we cannot retrieve it. Often, a person can even make accurate judgments about what a word sounds like or how long it is, yet still be unable to retrieve it. Here is a situation in which we are conscious that our memory is providing a great deal of information about a word, but not consciousness of the word itself.

It is almost taken for granted in traditional accounts of memory that remembering is accompanied by a sense or experience of the past, and also that the act of remembering is accompanied by a conscious feeling of awareness of the past. In fact, this simple view allowed psychologists to ignore consciousness, which for many years during the behaviourist era of the 1940s and 1950s was virtually taboo as a subject of study. But renewed interest in conscious phenomena, together with new experimental techniques, have made consciousness a flourishing research topic. A new perspective has emerged on the role consciousness plays in our behaviour which is leading cognitive

psychologists to overturn many laws of memory previously thought to be unassailable.

Remembrance of Things Past

Novelists have been keener than psychologists to ponder the relationship between memory and consciousness. One of the most graphic accounts of the experience of memory is in Marcel Proust's novel *Remembrance of Things Past*. As a result of eating a piece of madeleine cake with his tea, Proust's hero had a strong feeling of familiarity and a sensation that the cake was reminding him of some past event that he was unable to reconstruct. He describes how no sooner had he tasted the cake 'than a shudder ran through me and I stopped, intent upon the extraordinary thing that was happening to me. An exquisite pleasure had invaded my senses, something isolated, detached, with no suggestion of its origin.'

He knew that the curious sensations he was having were not simply due to the cake: it wasn't that the cake was so delicious that it could be causing those strange experiences. 'I sensed that it was connected with the taste of the tea and the cake, but that it infinitely transcended those savours, could not, indeed, be of the same nature.' Instead, he immediately attributed the sensations to memory: he knew that a memory was trying to force its way into his consciousness. Eventually he was able to draw the memory out into consciousness and was transported back to an occasion in his youth when his grandmother had given him a piece of the same cake. This simple event happening late in the hero's life, summoned up long-lost memories of the utmost vividness for him.

The central question that has motivated recent research is whether the relationship between conscious experience and memory is as simple as is usually thought.

Are we always aware that we are remembering? Psychologists and neurologists have been intrigued to discover some circumstances in which awareness of remembering can happen without the retrieval of any actual memory, as, for example, in Proust's case, and some in which memories appear to be able to express themselves in the absence of awareness. Thus the apparently intimate relationship between the retrieval of memories, on the one hand, and the conscious experience of memory, on the other, can be broken.

Consider, for example, people who can retrieve information without being aware of it. Neurologists have known for many years that patients with damage to the temporal lobes of the brain can lose their memory. Such patients are typically unable consciously to recall even recent events. One patient, 'H.M.', was subjected to scores of psychological tests on consecutive days. By the second day he had usually forgotten everything about the tests, and could not remember seeing them before.

Yet at the same time, amnesiac patients such as H.M. are clearly influenced by unconscious memories of past events. For example, when amnesiacs read a list of words, including, say, the word 'reed', and are later asked to remember those words, they have great difficulty doing so. But if they are asked instead to spell the spoken word, they will be more likely to spell it as 'reed' rather than the more common 'read'. The word is in memory to the extent that it influences their spelling, but is unavailable for conscious recall.

Memories that reveal themselves in the absence of awareness have been termed 'implicit memories', and the study of the implicit memory has become particularly interesting to psychologists. In many situations, 'normal' people who cannot consciously recollect an event can be shown nonetheless to retain some unconscious trace of that event. We appear to 'know' far more than we can consciously report.

Imagine that in a psychology experiment you are shown a list of words (this is called the 'study' list) that includes, for example, the word 'mystery'. The study episode is followed some weeks later by a test. It is unlikely that you would then be able to remember many of the words. But if you were, instead, shown the word fragment '_ys_e_y', and simply asked to complete this fragment, you are more likely to produce 'mystery' as a completion than you

would if you had not read that word previously. Although you cannot consciously remember the word, it has left behind some record in your mind.

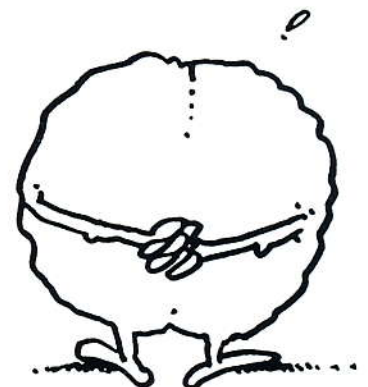
Psychologists have now invented a variety of such implicit memory tests. For instance, if a word is flashed in front of you for about 0.035 seconds, it will be difficult to name the word, because the exposure duration is so short. But if you had read the word, say, 24 hours previously, you would be much more likely to name it. Again, this is an implicit memory test: the instructions do not require you to consciously remember any previous study episode. Your ability to say the right word indicates that a prior episode can influence future behaviour without awareness.

More traditional memory tests are explicit because they do require the person to consciously remember a prior episode. The most common of all memory tests, free recall, is typical of this: some time after reading a list of words, the person is asked to remember the words they saw previously. Another commonly used explicit memory test is recognition. Here, several words are presented and the person is asked consciously to remember which of them they had seen earlier.

So results from implicit tests show that memory and consciousness can readily be separated. Several researchers have claimed that such findings provide evidence for distinct memory systems in the brain. One of the most forceful proponents of this view is Daniel Schacter of Harvard University. He believes that quite different memory systems of the brain underlie performance on explicit and implicit tests, and that the conscious experience of memory is associated with only one of those systems, the explicit one. The strongest reason for supposing there are two independent systems comes from the discovery that a variety of factors have very different effects on performance in explicit and implicit memory tests.

Some of the major examples of these factors are worth considering, because they show that many of the cherished generalisations about memory that psychologists have held to be correct are false. For a start, it has been known for many years that memory for pictures is better than memory for words when explicit memory tests are used. Subjects can recall a large number of objects better if shown pictures of the objects rather than a list of the names of the objects. For instance, it is

*We appear to
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A BRIEF HISTORY OF THE WORLD CHESS CHAMPIONSHIPS

With the World Chess Championship currently in full swing in London, GM Raymond Keene OBE (BCM 275) takes a look at the history of this challenging mind sport.

The Unofficial Champions

Before the official title of World Champion was inaugurated in 1886 there were a number of players who could justly claim to be the strongest in the world, although there was not yet a formal championship.

The encounters between the Frenchman La Bourdonnais and McDonnell, who was Irish, were too diffuse to be seen as a real prototype for the modern title matches, although in the year of 1834 the two played no fewer than 88 games. The eventual score was 44 wins to La Bourdonnais and 30 to McDonnell, with 14 draws. Their play was notable for energy and ferocity rather than finesse.

The first match which closely resembled a modern world championship was the Staunton-St Amant contest in Paris in 1843, which established an Englishman, Howard Staunton, as the foremost player in the world. Twenty-one games were played and Staunton scored eleven wins to his opponent's six.

In 1851 the innovative and indefatigable Staunton organised the first ever international tournament, which was staged in

London to coincide with the Great Exhibition held in Hyde Park that year. Participants included Wyvill, Williams and Staunton himself, but the German player Adolf Anderssen was the clear winner.

Seven years later when Paul Morphy, the undisputed American champion, arrived in Europe, he sought matches against the leading continental players and roundly beat Anderssen in a match played in Paris.

In the same year, Staunton, perhaps the first unofficial world champion, met Morphy. It was only a consultation game but there is no doubt, given the crushing nature of Morphy's victory, that the art and science of chess had moved on considerably since Staunton's domination of the game in 1843.

Somewhat surprisingly, it is the French who are now most busily engaged in creating a memorial to the greatest English player before the advent of Nigel Short. Staunton (played by James Wilby, of *Howards End* and *Lady Chatterley* fame) will be the subject of a French film *Echec* (loosely to be translated as *checkmate*) set in France in the 1840s. Charlotte Rampling is the female lead.

Anderssen had established himself at London in 1851 as, *de facto*, the greatest living master. In 1858, though, Anderssen lost a match to Morphy, but when Morphy retired prematurely Anderssen once again was regarded as the man to beat. The next turning point was the fascinating clash between Anderssen and Steinitz in London in 1866.

There have been claims that Steinitz's tenure of the World Championship truly dates back to this match. It would, however,

Howard Staunton - Nigel Short's great predecessor.



have been undiplomatic, to say the least, to claim to be 'World Champion' while Morphy lived, even though he was inactive. Morphy died in 1884, having spent the last two decades of his life immersed in depression.

The Advent of the Official World Championship Match

During the 1880s Wilhelm Steinitz and Johannes Zukertort had emerged as clearly superior to all of their contemporaries. Both of them claimed to be the strongest player in the world. After a series of bitter verbal exchanges the two men finally met at the chessboard to resolve their conflict. Steinitz scored a decisive victory with ten wins to Zukertort's five.

The outstanding matches in the history of the World Chess Championship have, by general consent, been those which exhibited a fierce contrast in the playing style of the two protagonists. At the very dawn of recognised world championship play in 1886 the fiery imagination and tactical arsenal of Johannes Zukertort, although meeting with initial resounding successes, ultimately foundered on the rock hard strategic logic of the new scientific school propounded by Wilhelm Steinitz. After a series of fascinating games Steinitz was declared the first official chess champion of the world.

The new champion held the title until 1894, when he lost a match to the rising German star Emanuel Lasker. A second defeat at Lasker's hands in 1896 was, perhaps, a partial cause of Steinitz's suffering a nervous breakdown, from which he never fully recovered. He died in a state of poverty as a public ward of the City of New York in 1900.

Steinitz was the chief promoter of the 'Modern' school of chess, a system which rejected the pyrotechnics of sacrifices and combinations, concentrating instead on positional play aimed at the accumulation of small advantages. Yet Steinitz, too, was to meet his master eventually in the shape of Emanuel Lasker. For all his strategic skill Steinitz could not cope with the slippery

shifting pragmatism of Lasker's style, a style possessed of such flexibility and resilience that it was to maintain Lasker's grip on the supreme title until 1921, when he was defeated by the Cuban genius Capablanca. However, when Lasker and Capablanca had first clashed at St Petersburg in 1914, Lasker proved the stronger.

Kasparov's Chess Idol

Garry Kasparov has often stated that Alexander Alekhine is his chess hero. Their stylistic resemblance is clear to see. Both love combinations and the attack, though in 1927, when Alekhine had to face the virtually invincible Capablanca for the World Championship, he curbed his natural predilections in order to become a super-strategist. Kasparov had to learn the same lesson when struggling against Karpov six decades later.

From 1927 until 1946 (with a two-year gap after his defeat in the first match against Euwe) the genius Alexander Alekhine held sway over the chess world. Alekhine had a style so multi-faceted that he could overmatch Capablanca in the Cuban champion's own blend of trench warfare and victory by attrition. Nevertheless, Alekhine was far more at home in the confused tactical melées which characterised his four matches from 1929 until 1937 against Bogoljubow and Euwe.

During the 1950s chess was dominated by the Soviet School, exemplified by Botvinnik and Smyslov, players so close in style that their games were hardly distinguishable from each other. It was not until 1960,

Alexander Alekhine, whom Kasparov has often cited as his chess hero.



World Championship Match, Holland 1937

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	Total
Alekhine	0	1	½	½	0	1	1	1	½	1	½	½	0	1	½	½	0	½	½	½	1	1	½	1	1	15½
Euwe	1	0	½	½	1	0	0	0	½	0	½	½	1	0	½	½	1	½	½	½	0	0	½	0	0	9½

when the vibrant young Latvian Mikhail Tal inflicted a crushing defeat on Mikhail Botvinnik, that the stylistic clash to be found at the core of great matches once again became truly visible. Botvinnik's Olympian calm was repeatedly shattered by the Napoleonic force of the young Tal: their games were replete with grand strategic designs occasionally triumphing, but more often collapsing under the variegated assault of tempestuous tactical sorties. For connoisseurs, the two matches between Botvinnik and Tal in 1960 and 1961 represented some of the most bloodthirsty and exciting chess seen at world championship level. Although he was defeated in the first match Botvinnik, employing subtle psychology, triumphed in the second, exploiting Tal's dislike of simplification and the endgame.

Mikhail Botvinnik had won the World Championship in 1948, finishing ahead of Smyslov, Reshevsky, Keres and Euwe in the quintangular match tournament held to determine the new champion after Alekhine had died in possession of the title. During

the 1950s and early 1960s Botvinnik had to fight off challenges from Mikhail Tal, as well as David Bronstein, Vassily Smyslov and Tigran Petrosian. Smyslov drew with Botvinnik in 1954, seized the championship in 1957 but a year later succumbed in Botvinnik's revenge match. As we have seen Tal also briefly deposed Botvinnik, only to lose the title back in a revenge match. It was Petrosian, in 1963, who eventually and definitively unseated Botvinnik from the world throne, and this time Botvinnik did not have the right to a revenge match!

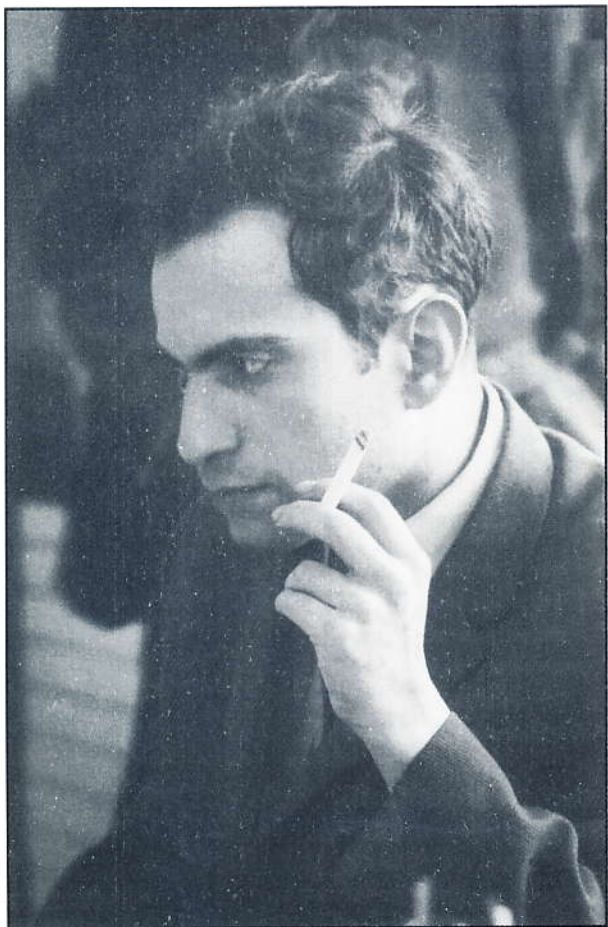
A Western World Champion

Although Petrosian narrowly succeeded in defending the title in against Boris Spassky in 1966, he eventually relinquished it to Spassky in 1969. Spassky in turn was usurped by the unpredictable American Bobby Fischer in a titanic match in Reykjavik 1972. Spassky was an adventurous attacker. His play was very much in the mould of Tal and Alekhine, yet in Fischer he succumbed to the prophet of heroic materialism. Fischer was a chess superman who would snatch material in a fashion that might have seemed sordid in a lesser player, only to release it at the appropriate moment for overwhelming advantages in terms of the initiative, mobility and striking power. It was a tragedy for the world of chess that Fischer ceded the title by default to Anatoly Karpov in 1975 and did not play a single serious tournament or match game for the two decades from 1972 to 1992.

The Greatest Rivalry

After successfully defending the title twice against the Soviet defector Viktor Korchnoi, Karpov had to face a fresh challenge in 1984 from Garry Kasparov, whose rise to challenger status had been nothing less than meteoric. Their first match ended in controversial circumstances when the FIDE President Florencio Campomanes stopped the match after more than five months' play claiming exhaustion on the part of contestants and organisers. Kasparov disputed this decision vehemently and accused Campomanes of coming to Karpov's aid just when Kasparov was looking as if he might snatch victory from the jaws of defeat. This injustice must have spurred Kasparov to greater efforts in his assault on the crown, for in the return match in 1985 he seized the title in dramatic fashion to become the youngest World Champion in history. Since 1985 Kasparov has successfully defended against Karpov on three occasions, most recently in the 1990 match, split between New York and Lyons. The apparent narrowness of Kasparov's margin of victory is illusory. Kasparov had the match wrapped up by game 22, but slipped back to lose game 23 after he had already decided the contest in his favour. After this match Karpov was defeated by Nigel Short in the elimination cycle and the challenger baton was passed to the young Englishman. Can Nigel make history by defeating Kasparov and become the fourteenth official World Champion?

Mikhail Tal, the magician of Riga and an unusual exception to the law of mens sana in corpore sano.



AMAZING MEMORY STORIES

The Dominic of His Day

Chess and Memory

Paul Morphy, one of the great world chess champions, was born in New Orleans in 1837 and developed an exceptional talent from an early age – at 13 he was already established as one of America’s leading players. He came to Europe in 1858 and, to everybody’s surprise, defeated the cream of European chess: Löwenthal, Harrwitz and Anderssen were all overwhelmed in matches over a six-month period.

Morphy was able to reach these astronomical heights in chess with relatively little traditional-style study of the game, because he was able to depend upon a naturally studied and developed ability to make images and to translate this into an astonishingly powerful memory. Like Bidder, Heineken, Magliabechi, and others before him, Morphy used the base of his knowledge to extend himself into other fields, acquiring on his way to the world chess championship, four different languages and a degree in law.

Morphy also distinguished himself in another extraordinary mental memory field: blindfold chess. Morphy developed this skill to play many simultaneous games blindfolded – a mental test which requires a perfect recall of every new position in every simultaneous game. He also applied his memory to law and could recite verbatim most of the Civil Law Code of Louisiana.

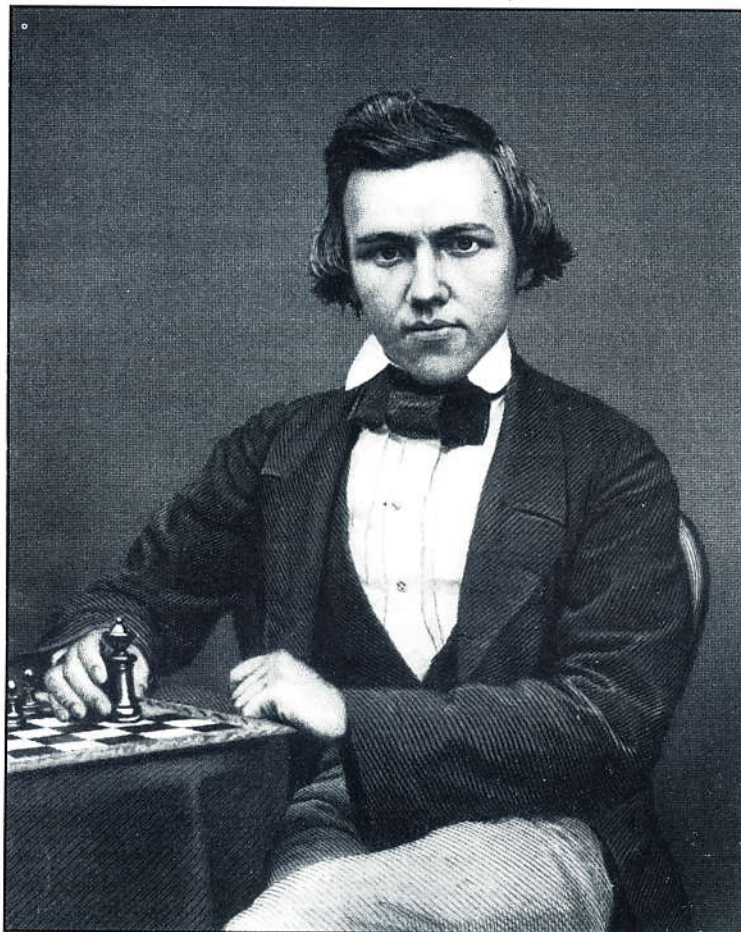
As his fame spread, so did knowledge of his claim that he could remember the moves of every championship game he had ever played in his life. People stopped at this claim, but it was not put to the test. Then one day it was realised that records of over 400 of his games had been lost, so Morphy simply sat down and wrote out the lot! His opponents and referees of the games

subsequently confirmed that all the reconstructions he had made were exact.

The remarkable skill that Morphy exhibited is an example of a talent that can be developed in every memory – the ability to retrieve in detail the most complex of memory events, even those which may appear to have been lost forever, but which the remarkable brain retains perfectly.

Synapsia invites readers to submit their own amazing memory stories for publication in future issues.

When it was realised that records of over 400 of his games had been lost, Morphy simply sat down and wrote out the lot!



Paul Morphy, 'the pride and sorrow of American chess'.

Paris 1858

	1	2	3	4	5	6	7	8	9	10	11	Total
Morphy	0	½	1	1	1	1	1	½	1	0	1	8
Anderssen	1	½	0	0	0	0	0	½	0	1	0	3

ANIMAL INTELLIGENCE

Pet Power!

'There is obviously some deep form of communication going on between animal and human synapses.'

Raise Your Intelligence, Lower Your Blood Pressure - Buy a Pet!

Warwick Anderson, of the Baker Medical Research Institute in Melbourne, has produced the best evidence so far that pets are good for your mental (and physical) health. Anderson examined 5,741 people aged between 20 and 60, 784 of them pet-owners, by offering them free health risk evaluations.

Pet-owners turned out to be less stressed mentally, and to have significantly lower levels of cholesterol and triglycerides, as well as having lower blood pressure. The differences were similar across groups who dieted differently, or who were in different socio-economic categories.

The difference is impressive says James Serpell of the Companion Animal Research Group at Cambridge. Serpell says the difference is 'stronger than improvements found in comparable studies on people who have switched to vegetarian diets or taken up exercise programmes.'

As most problems with health tend to stem from the use of the brain, there is obviously some deep form of communication going on between animal and human synapses (A recent BBC2 programme, *Cracking the Code*, cast light on some recent research into genetics which parallels this. It seems that DNA from different species, e.g. humans, worms

and yeast, is much more similar than was thought. It has proved possible for defective yeast cells to be corrected by the introduction of human DNA into their systems! - Ed.) Says Anderson, commenting on what would happen if a drug was available that achieved such extraordinary results: 'that drug would be hailed as a major breakthrough.'

More Bugs in the System

The British Small Animal Veterinary Association report that more and more people now prefer the companionship of spiders, beetles, butterflies and stick insects to the more 'traditional' cats and dogs.

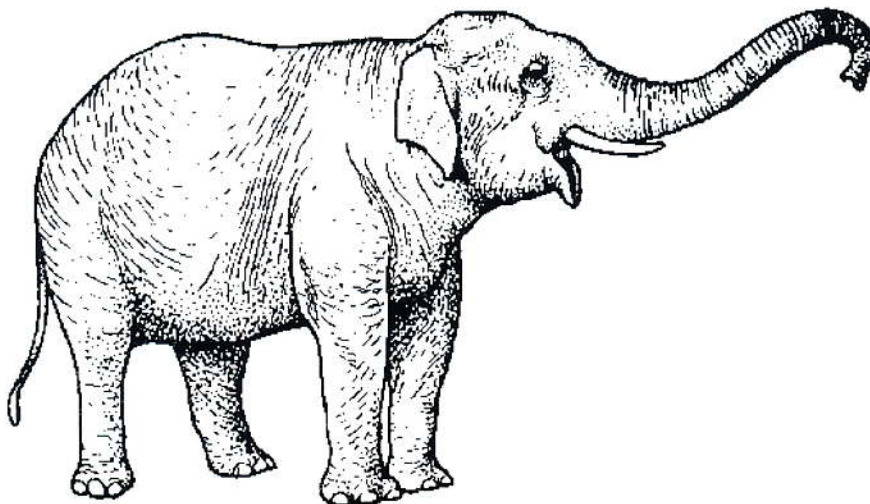
Reasons given for the rapidly rising new trend include the fact that the insects' behaviour is much more complex and interesting than had previously been thought, and that some form of mental rapport does seem to grow between pet and owner.

Mary Branca, president of the society, confirms that insects can be quite selective, and will 'allow a person who normally looks after them to do things like picking them up and handling them, that they would not let a stranger do. You do get a rapport with the insect, and it is more exciting to get a rapport with an invertebrate.'

Record-Breaking Polly

The *Young Telegraph* reports that the most talkative pet bird was an African grey parrot named Prudle. The prattling polly knew nearly 800 words!

Mowgli



Synapsia looks forward to readers' opinions on the relative mental skills of their pets!

INTELLIGENCE ABOUT INTELLIGENCE

Brick-brains and Feather-brains

Is Size Important?

For centuries scientists have argued over whether the size of a person's brain is linked to their intelligence. The conventional view is that the quality rather than quantity of brain tissue explains differences in intellect, but this orthodoxy is currently being challenged by two groups of independent researchers, one at the University of Iowa College of Medicine, and the other at the University of Western Ontario, using high-tech electro-magnetic body scanners.

The Iowa team, headed by psychiatry professor Nancy Andreasen, took a sample of 37 men and 30 women with an average age of 38 and an average IQ of 116, and discovered that up to a third of the variations in IQ scores could be explained by the size of the brain or its sub-regions: 'There is a modest but statistically significant relation between intelligence, as measured by the standard IQ test, and the volume of brain structures, regions and tissue. The larger the brain, the higher the IQ.' Although their results have been reproduced in two subsequent unpublished studies, Andreasen and her colleagues remain cautious of their findings, and suggest that other factors are also important in determining intelligence.

Meanwhile in Ontario, researchers have been carrying out similar tests on groups of women, and have discovered that their brain sizes are more related to verbal skills than spatial ability. This controversial finding fuels the age-old 'nature versus nurture' debate. However, some psychologists are highly sceptical of attempts to link sex differences and intelligence. According to Helen Haste of the University of Bath, using IQ as a measure of the different and complex aspects of intelligence 'is like trying to measure electrons using a 12in ruler.'

Bird-brains, Hare-brains and Human-brains

Whether one accepts that there is a relationship between brain size and human intelligence or not, it is clear that brain size (relative to body size) is one of the major factors which distinguishes humans from other mammals, and mammals from other

animals. Although reptiles are as small-brained now as they were in prehistoric times, nearly 200 million years ago there was a great leap forward in relative brain size with the evolution of the early mammals, who were four or five times brainier than the average reptile. This increase can largely be explained by the appearance of the cerebral cortex, a thin layer of cells covering the forebrain which is responsible for all conscious thought. The cortex is unique to mammals and cannot be found in birds, which evolved only shortly after mammals and with an equivalent brain size.

For at least another 100 million years the mammalian brain remained roughly the same relative size, but then it began to expand with the evolution of modern mammals. Not all mammals were equally affected by this jump – insectivores and some marsupials retain around the same brain-to-body ratios as the archaic mammals.

Allowing for body size, human brains are around six times larger than the average mammal (as are some cetaceans, such as dolphins), whereas monkeys' brains are only two or three times larger than the mammalian norm. However, the most significant advance is not the increase in brain size in itself, but the development of the cortex, which occupies 70 to 80 per cent of brain volume.

The human visual, auditory, and olfactory systems are relatively smaller than those of an ape, but a greater proportion of the brain is devoted to neural circuitry, and it is this circuitry which distinguishes us from our cousins, allowing a unique cognitive ability as well as a highly developed means of language.

Using IQ as a measure of the different and complex aspects of intelligence 'is like trying to measure electrons using a 12in ruler.'



PROOF OR GUESSWORK?

Last month *Synapsia* reported how a centuries-old mathematical conundrum had been solved. Wilf Hey uncovers the remarkable background to Fermat's Last Theorem.

Wilf Hey (BCM 854) is disk editor of *PC Plus* — a best-selling British computer magazine. He also appears in *PC Answers* (a sister magazine) and *Virus News International* (a specialist computer security magazine).



The Prince of Amateurs

Pierre de Fermat, a seventeenth-century lawyer, earned his reputation amongst mathematicians as 'the Prince of Amateurs'; and made important discoveries in his favourite field, Diophantine analysis. Diophantus was a mathematician in the early Christian era (circa the third century, though his dates are not known exactly) who posed and solved mathematical problems that involve only whole numbers. You may think that problems are simplified when you can ignore decimals and fractions, but instead you will find a whole new — and different — complexity.

Here are a few problems that involve working with whole numbers alone — to give you an idea of the different kinds of thinking and figuring that must go on. The answers (without the working out) are given at the end of this article.

1. Name the smallest number which is twice a square number, three times a cube, and five times a fifth power. (25 — which is 5×5 — is an example of a square number;

and $32 = 2 \times 2 \times 2 \times 2 \times 2$ — is an example of a fifth power.)

2. Three men were shipwrecked on a tropical island. They spent their first day gathering coconuts, and by nightfall had placed them all in a large pile, before falling asleep exhausted. In the morning when they awoke they divided the pile equally between them — no fractions, remember!

One of them sheepishly admitted

'You know, I didn't trust you fellows; in the middle of the night I got up, took my third of the pile and hid it. As I returned a monkey started making a racket, so I threw a coconut at him from the remainder of the pile to scare him away.'

Another said 'I was about to confess exactly the same thing! I wonder whether I awoke before you, and took a larger share, or after you and got a smaller share.'

'I did the same thing too!' said the final man, 'It seems that we all tried to swindle each other. I wonder if we all saw the same monkey? If so he made off with three coconuts for an easy night's work.'

It would be unfair of me to ask how many coconuts were in the original pile, wouldn't it? There are actually many possible answers; just give me the lowest two.

How Fermat Discovered the Theorem

Fermat owned a copy of Bachet's *Arithmetica* (translated from the works of Diophantus), a book replete with problems created and solved by that mathematician of the ancient world. One page is devoted to the task of 'dividing a given square number into two squares', which is significant because the square root of these three square numbers will be sides of a right-angled triangle. For example, 169 is the square of 13; it can be split into $25 + 144$, each of which is also a square (25 is 5×5 ; 144 is 12×12). The three numbers 5, 12 and 13 may indeed be the length of three sides of a right-angled triangle. This page gave the method Diophantus had found to split squares like this (when they can be split like this, that is!).

Fermat had the thinker's habit of writing notes in the margins of books; and after his death in 1665, a librarian who inherited his books found a note on this particular page, written in Fermat's tiny neat letters:

'On the other hand it is impossible to separate a cube into two cubes or a biquadrate into two biquadrates, or generally any power except a square into two powers with the same exponent. I have discovered a truly marvellous proof of this, which however the margin is not large enough to contain.' Ever since, both professional and amateur mathematicians have called this 'Fermat's Last Theorem', and have campaigned for wider margins in books designed for ownership by minds of genius class.

Let's express the theorem in symbolic terms:

'The equation $a^x + b^x = c^x$ has no whole-number solutions where x is greater than two.'

By the way, this should not be confused with 'Fermat's Theorem', which states that 'if x is any integer not divided by the prime p , then $x^{p-1} - 1$ is exactly divisible by p^2 . We won't go into this now, but be assured that this is a cornerstone of number theory, and extremely important in the field of factoring very large numbers – vital in modern cryptography.

Nor would it be right to think that Fermat's Last Theorem was an entirely new concept; the Arab mathematicians preceded Fermat by seven centuries, maintaining that $a^3 + b^3 = c^3$ has no solution. Fermat was the first to say that there was a proof that x could never be greater than two.

Early Attempts

Fermat had a great reputation. Putting the Last Theorem to one side, he never mistakenly claimed that he had a proof; you could rely on Pierre to be thorough and correct. In fact, even most of his guesses ('conjectures' in mathematical terminology) were correct. Once he stated that he thought numbers of the form $2^n + 1$ (where n itself was of the form 2^k) were all primes. He was proved wrong – there are exceptions – but, strangely enough, this actually enhanced his reputation, in view of the fact that he was careful not to overstate his belief.

But when the rest of the world heard about the Last Theorem, Fermat was already dead. Apparently he didn't find a wide enough margin anywhere, or for some other reason never got around to recording this proof. It is wrong to call it a theorem until it is actually proved – and we only have this little note in the margin to tell us that it deserves that name. That is, until a few

FERMAT'S LAST THEOREM

If x is a whole number larger than two and a , b and c are all whole numbers larger than zero, then the equation

$$a^x + b^x = c^x$$

has no solution.

months ago.

Most of the mathematical world was eager to prove Fermat right – or wrong. The genius C F Gauss scorned the search, declaring that it was an unimportant wild goose chase; but this was only after he had spent an unsuccessful summer trying to prove or disprove it. The first few onslaughts found proof that Fermat was right about certain numbers; in his little formula, x could not be 3 or 4. (It was Leonard Euler who proved this – while trying to disprove Fermat's idea. Euler's name was pronounced 'Oiler' and his general attitude towards others earned him the nickname among English academics of 'Euler the Spoiler'.) Then came the famous F Lindemann – the man who single-handedly had demonstrated that Pi was transcendental. He published the 'marvellous proof' that Fermat had left unpublished. Unfortunately, there was an embarrassingly simple flaw several pages into his paper – and much to his chagrin it was found not by another acknowledged genius but by a local merchant – a mere dabbler.

In 1857 E E Kummer had proven that x could be no number above 2 and under 101 – except possibly 37, 59 and 67, and this feat earned him a gold medal from the Academie Francais. Note that we are now dealing with numbers that most ordinary citizens would regard as big: 2^{37} is over 137 billion, and that is the smallest number that could appear in a counter-proof, showing Fermat to be wrong. In 1883 the Brussels Academie declared no winner in a competition to advance this proof. Then Dr F P Wolfskel bequeathed one hundred thousand marks for a complete proof in 1908.

'On the other hand it is impossible to separate a cube into two cubes or a biquadrate into two biquadrates, or generally any power except a square into two powers with the same exponent. I have discovered a truly marvellous proof of this, which however the margin is not large enough to contain.'



The man whose famous theorem has defeated generations of mathematicians, Pierre de Fermat (1601-1665). (Courtesy of the Mary Evans Picture Library.)

Although this attracted a lot of competition (especially among schoolboys and crackpots) the prize was not won.

Step-by-step over the years, proofs were found that excluded even 37, 59 and 67 – then all numbers below 7000. Soon the lower limit for x was raised to the dizzying number 253,747,880 – certainly beyond the reach of the most dedicated schoolboy

amateur using a ream of paper to find a counterproof. (Incidentally, if x were found to be anything over than 300, all three numbers in the sum would be greater than the number of sub-atomic particles in the universe.)

It looked more and more as if Fermat was right, but nobody else was able to uncover 'his truly marvellous proof'. As time

went on, and Fermat became a historical figure, a new generation of mathematicians was born, and somebody dared suggest that Fermat had made a lucky guess, but didn't have a proof.

Twentieth-century mathematicians continued the search, but had to content themselves with partial proof, excluding more and more numbers. In 1932 C M Walsh published a new attempt to prove Fermat right – but he knew his work had flaws in it. W W Rouse Ball said 'Mere numerical verifications have little value, no one doubts the truth of the theorem, and its interest lies in the fact that we have not yet succeeded in obtaining a rigorous demonstration of it' (*Mathematical Recreations and Essays*, Macmillan, 1939).

In 1954 a number theorist by the name of Yutaka Taniyama conjectured that for certain elliptic curves there are matching shapes in the hyperbolic plane. One must bear in mind that every curve and every shape that you can imagine (and even more that you can't) has an equation which can be used to describe it. Descartes developed a form of geometry (known as Cartesian) that you may remember from school, whereby algebraic statements could be seen as shapes on a graph. This is an extension of that idea – but one must appreciate that Taniyama's elliptic curves involved whole numbers, and that the hyperbolic plane is like a flat map twisted to make a sort of giant dimple. (Go ask a mathematician if you have a few years – and a few miles of paper – to spare!)

In 1984 Gerhard Frey (from the University of Essen, Germany) suggested that if anybody ever found a case that disproved Fermat's Last Theorem, that case would generate an elliptic curve that did not match a shape in the hyperbolic plane. It follows that if Frey was correct and Taniyama's conjecture was correct, so was Fermat's Last Theorem – even though the two mathematical statements didn't look (on the surface) to be related in any way. Two years later, Kenneth A Ribet (from Berkeley, USA) proved Frey was absolutely right.

Resolved at Last?

At a series of lectures at Cambridge University in June this year, a 40-year-old mathematician named Andrew J Wiles (who himself comes from Princeton) dropped a bombshell. Without any prior

headlines, he calmly demonstrated the result of his researches. Borrowing a nineteenth-century mathematical technique that had been all but forgotten, he was able to reason that the 'number' of semistable elliptic curves is the same as the 'number' of a special kind of shape in the hyperbolic plane. (I say 'number' because there are an infinity of them – but it is the same kind of infinity, so they can be matched one-for-one: go see your Friendly Neighbourhood Mathematician again!) It was already clear that each of these special shapes would be able to make a semistable elliptic curve, therefore. The audience of academics gasped about twenty seconds before Wiles announced it: Taniyama's conjecture was proven correct – which meant that Fermat's Last Theorem must be true!

We must note that mathematicians (and computers) are even now combing over Wiles's proof: it is not a nice, simple one that you could find in any margin, however big; and involves concepts never imagined by mathematicians in Fermat's day. But everybody in the world of mathematics remembers the red face of Lindemann. *Les jeux sont faits*, and there are no more bets; but nobody is willing to say anything except that Fermat's Last Theorem is *probably* conquered.

Douglas Hofstadter, in his award-winning book *Gödel, Escher, Bach - An Eternal Golden Braid* (Penguin, ISBN 0 1400 5579 7) parodies Fermat's Last Theorem in a chat between Achilles, the tortoise, and an ant-eater: the ant-eater introduces a theorem by Fermat, 'a mathematician by vocation but a lawyer by avocation', who considered the equation $2^a + 2^b = 2^c$.

The fictional Fermat realised that this has infinitely many solutions for a , b and c and wrote this in the margin of a book he was reading, 'The equation $n^a + n^b = n^c$ has solutions in positive integers a , b , c and n only when $n = 2$, but there are no solutions for n greater than 2. I have discovered a truly marvellous proof of this statement which, unfortunately, is so small that it would be well-nigh invisible if written in the margin.'

Fermat's margins appear likely to be the source of much consternation (and satire) for some time to come; although his Last Theorem appears to have been proved – finally – his 'truly marvellous proof' has escaped detection.

Solutions

1. The number required is $2^{15} \times 3^{10} \times 5^6 =$ over 30 trillion (or old-style 30 billion): there are higher numbers that fit the bill, and they are all in the form $2^{(30x+15)} \times 3^{(30x+10)} \times 5^{(30x+6)}$. I chose the smallest, where x is zero.

2. The smallest number of coconuts that would fulfil the conditions would be 78, and the next smallest 159. In the case of 78 in the pile, the cheater would hide away 26; the second hide away 17, and the third would hide away 11; the monkey would have gathered three, leaving seven pieces to be divided amongst the three castaways on the next morning. All solutions are of the form $81x - 3$: note that 81 is the cube of 3, and the [-3] are the coconuts thrown to the monkey. In practice, 78 coconuts is probably too small a number for the pile, as it would be painfully obvious that there had been a robbery in the morning. Or maybe that's what prompted the confessions!



Mind mapping is a cornerstone of Tony Buzan's technique for using the brain to its full potential. Having struck upon the concept in the early seventies, he has continuously refined and developed this theme. Now he has written a book about it. Byron Jacobs, editor of *Synapsia*, reviews.



Contemporary society is becoming an ever more complex place to live. The remarkable technological developments over the last twenty or so years have given birth to an unparalleled information explosion. New avenues and opportunities have been opened up for all of us. We have countless possibilities for acquiring information: newspapers, magazines, journals, books, TV channels, teletext, etc. In order to cope with life's increasing complexity, we are also expected to take on board many new skills, as is most apparent in the job market. Being, for example, a secretary is often no longer enough. You may, perhaps, be expected to have knowledge of the latest software packages, a foreign language, personnel management, experience of accountancy and so on. Acquiring such new skills means taking on board yet more information.

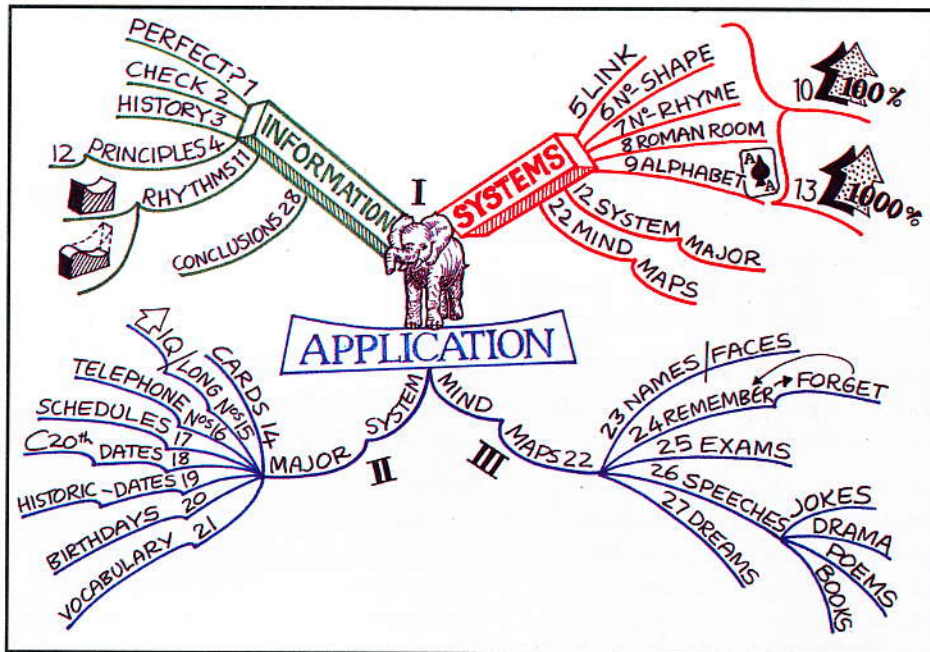
All this serves to make life more interesting but it does bring its own problems; how are we to cope with the morass of data that bombards our brains on a daily basis? Given the limited amount of time that we have to deal with any project, how are we supposed to accumulate, assimilate and most importantly, process this information? We do, of course, have perfectly satisfactory methods for holding simple factual data: diaries, filofaxes, electronic organisers, computers, backs of envelopes and so on. Ideal for storage purposes but sadly inadequate for the task of processing data, except in the most basic and linear form. What we really need is a super-supercomputer, a machine capable of taking on board almost limitless amounts of data, maintaining perfect recall of it, with the ability to retrieve and manipulate any of it at a moment's notice. Fortunately, thanks to an inspired piece of design work, we have all been given one - the brain. Unfortunately,

and unlike almost anything you get these days, it comes without instructions (not even in Japanese). Thus we are, in the main, reduced to trial and error to discover how we can make best use of our awesome mental abilities. What we need is a guide that tells us how to utilise this most valuable asset to the full. This guide is *The Mind Map Book*: a technical manual for the brain.

Virtually 100% of the time, information that is presented to us arrives in a linear form: lines of text, rows of figures, lists of instructions etc. This is the mode we have chosen to transmit ideas to each other. Unfortunately the brain is less than impressed by such methods and is much happier at dealing with imagery than dry collections of text and figures. Therefore this mode of presentation is a turn-off and consequently the brain struggles to cope. This can easily be verified by a simple experiment. Write down a ten digit number and try to commit it to memory in such a way that you are sure you will still know it in a week's time. Not so easy. In contrast, look at a picture for just a few seconds. The chances are that, in a week's time, and without even trying, you will be able to recall an extraordinary amount of data concerning the image.

The brain's extraordinary ability at dealing with imagery is backed up by a fascinating experiment, reported in the 1970s in *Scientific American*, and quoted in *The Mind Map Book*. The experiment was carried out by Ralph Haber, who showed his subjects a series of 2560 photographic slides, presenting one image every ten seconds. This viewing was carried out over a period of several days and after the last slide had been shown, the subjects were tested for recognition.

The recognition was carried out as follows: each person was shown 2560 pairs of slides, one from the series they had seen,



A mind map about Mind Mapping, taken from *Use Your Memory*, also published by the BBC.

while the other was from a similar, unseen set. On average, the accuracy of recognition was 95%. Haber then carried out a second experiment to test the ability of the brain to recognise at speed. The set up was the same as before, but with one slide being shown every second. The results were identical. In a third experiment, again at one per second, the slides were shown as mirror images. Again the same results ensued. Haber concluded that "... the recognition of pictures is essentially perfect. The results would probably have been the same if we had used 25000 pictures instead of 2500."

To cash in on this ability we need a technique that enables us to convert linear data into visual imagery and thus make it more accessible to the brain. Mind Mapping is such a technique, and *The Mind Map Book* is the definitive guide of how to go about it.

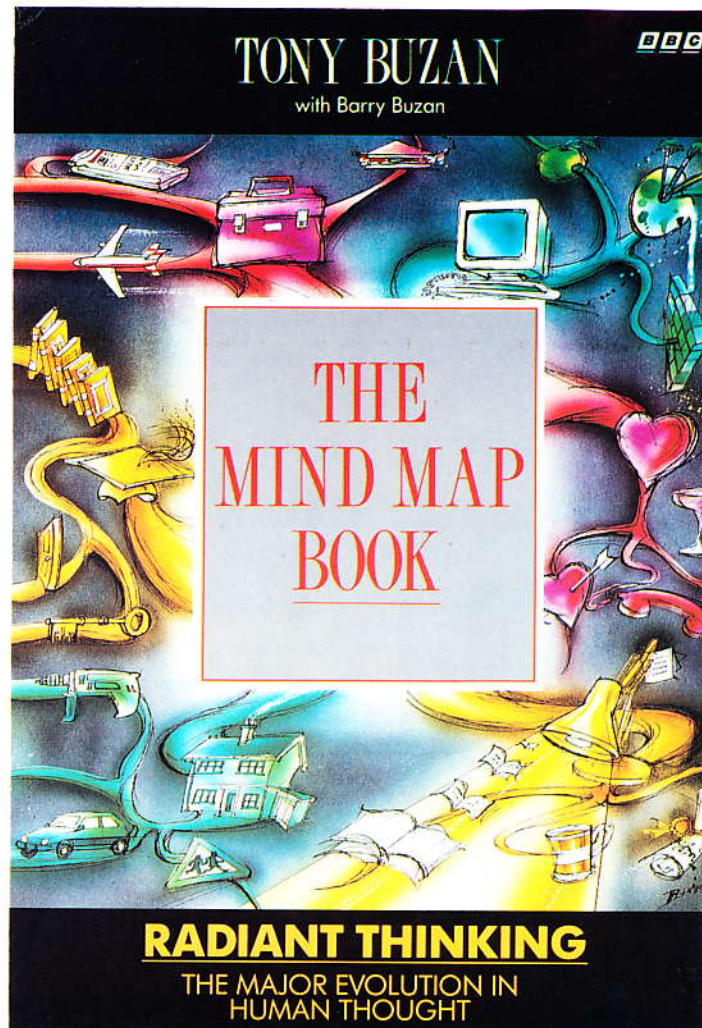
The Mind Map Book starts by exploring the natural architecture and fundamental operation of the brain, thus providing a useful framework for what is to follow. It continues by explaining how to harness and unleash the untapped power of the brain via this revolutionary method of accessing intelligence. Mind Mapping offers exciting ways to use and improve memory, concentration and creativity and is thus of relevance to anybody operating in any situation. The use of Mind Mapping in different contexts is explored in chapters on personal, family, learning and business and professional.

A major benefit of Mind Mapping is that it allows the user to expand and explore ideas while maintaining a clear focus on the central theme. By incorporating the use of

imagery and colour as visual stimulants, the Mind Mapping technique addresses the brain in the language it responds to best.

As well as being a fascinating read, the book also looks great. There are hundreds of images, photographs and, of course, Mind Maps, many of them on colour plates. Even the most image-hungry brain would be hard pressed to object to this production!

The Mind Map Book: Radiant Thinking, by Tony Buzan and Barry Buzan (BBC £16.99). ISBN 0 563 86373 8



Drawing is Natural

In this issue, Lorraine Gill continues her special series on the art of seeing and the visual alphabet. Follow her series, and learn both how to see and how to draw!

Artist Lorraine Gill (BCM 49) has already had ten one-woman art exhibitions and has written two books: *The Nature of Perception and How to Draw*.



Perspective

Perspective is a funny thing. Generally it means putting things in their place; getting priorities right. For our ancestors who first made marks, the main focuses of 'perspective' were food, fertility and knowing where they were on the landscape. Thus we have beautiful drawings of animals, stick figures of males and females and marks on stones denoting places and seasons.

Perspective changes according to when we are born and where. Over time, humans began to simplify animal drawings into abstract lines (an alphabet). With this code more information could be written onto a smaller surface (clay tablets). This led, over the millenia, to measurements; more ordering

and eventually to bureaucracy and schooling, as more people settled into one area and organised themselves into a society.

Drawings and sculptures became advertisements for the elders and Kings who won and lost battles, similar to billboards today, advertising to the people. Images gave perspective as a sequence of events, like a comic-book – a story to be read of the activities of those in power.

Perspective kept changing and is still changing. Most of us still see artistic perspective as an illusion of three-dimensional space where things recede into the distance, becoming smaller the farther they are away.

Three-dimensional perspective was an invention formulated by Brunelleschi, an architect who lived during the Italian Renaissance. He devised the formula of lines receding into the distance to a vanishing point and today we still use this to draw things

that 'look like what they are s'posed to'.

Coincidentally there is also the perceptual fact that our eyes are in constant kinetic assessment of the world about us, coding and de-coding the information from our environment by their analysis of the number of edges and light changes which perceptually are *always* in constant motion.

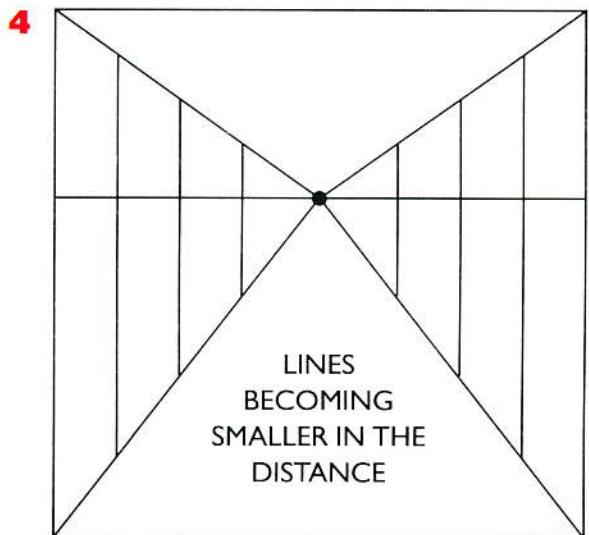
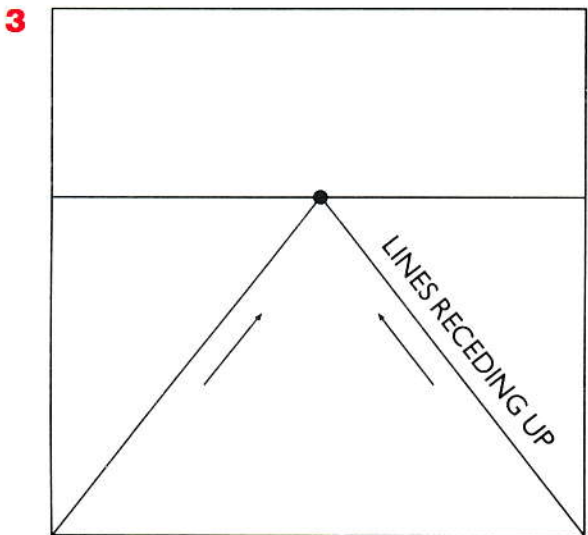
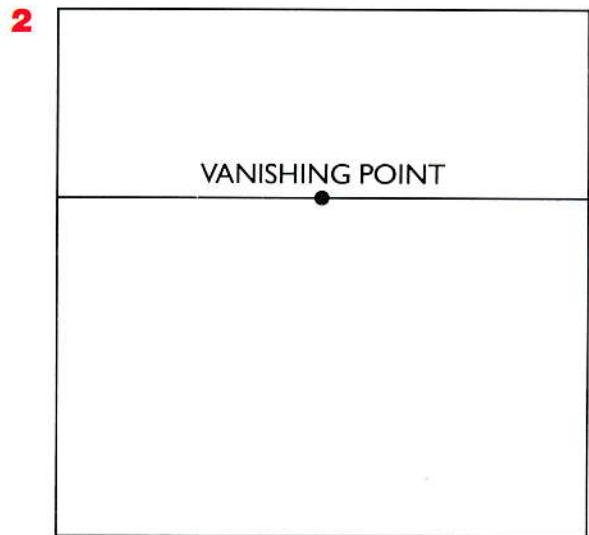
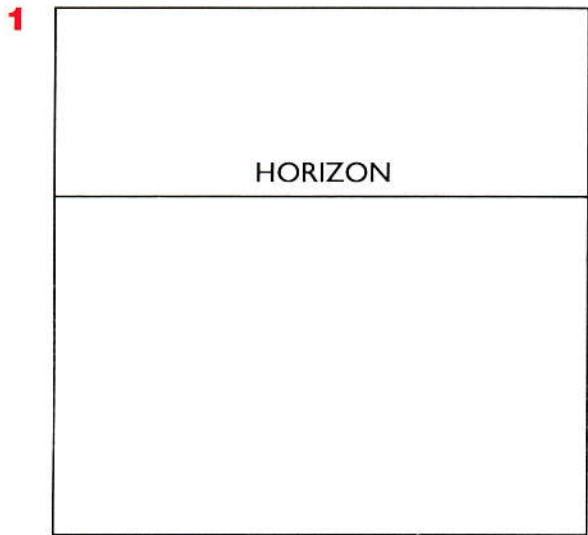
At some time or other we have all noticed, driving in the car, that the road's edges converge into one point on the horizon. Above this point the edges of the tops of buildings or trees will appear to converge *downwards* to this point. The edges below will appear to converge *up* to this point.

Drawing is simply looking at and then transcribing your looking knowledge into lines on paper.

Why not consciously look for these 'vanishing points'; they will be in line with your eyes wherever you observe your environment. Sometimes they are hidden by objects but they are always 'there' and are part of your 'alphabet of drawing' – abstract points in the distance by which to measure all objects related to them.

When you see a painting with three-dimensional space, play the visual game of finding the vanishing point the artist employed which gives the illusion of distance. After all, there is an alphabet to be read.

Why not do the simple exercises illustrated? They are designed to help familiarise your perception to horizon lines, vanishing points, and the lines which recede into the distance! Simply draw on a blank piece of paper the same images that are included with this article, noticing as you draw how the lines and vanishing point give you the impression of distance. In the fourth drawing, try adding some real images such as trees, houses, or people, to make the perspective even more 'real'. In the next issue we shall take this lesson further.



The king is dead. Long live the queen.

POETRY CORNER

ANAMNEMONICKER

*A Knight in armour falls pushed off his star
 By the crow of a cock. A wedding ring
 Bounced off a coffin but a finger caught it.
 A rapier dances away shining. A black
 Cloak is flung aside while the owner
 Flogs himself with nettles in a garden.
 An ignis fatui face, pale, grey bearded,
 Ponders a tuft of primroses. Too late
 For the hoop of steel. Too late for the nightbird
 Hurrying into the snare. A corpse in steel
 Topped by drunkards, calls from the foot of a cliff.
 A sulphur coffin, the crypt's candelabra,
 Warms the worm which serves as daily bread
 For the mole. A different worm is dinner
 To the carp which serves as brighter shadow
 To the half-dressed and half-witted. A pair
 Of Siamese Twins hunt with a pedigree Dachshund.
 What was a passport is a twist of paper
 Hiding a fiery poem and the egg of a blowfly.
 Prison bars bend under a trumpet blast
 Blown by the mask of a black knight who butchers
 The ring-finger with a hammer of nettles.
 A pigeon vomits a lily and a virgin
 Hides her face in a bible of lies. A dagger
 Slashes the air around its resting place.
 Suddenly carves a nun out of nothing.
 A rose devours itself and drops fragments.
 A dark horse broods crow's eggs in a mare's nest.
 It all comes out in a mirror. Even the dog
 Dashes from its kennel, sniffs at a king
 Sleeping on flowers bewailed by a laughing woman.
 A mouse chokes on a fable. A royal stag
 Stumbles under its arrow. The watchful flute
 Refuses to make music for dancing weasels.
 A cup of blood quenches heaven. Shackles
 Are shaken at fear. Burbling, the new baby
 Is invulnerable but the rat must perish.
 A crown in a back pocket hurts as bad
 As a boil that must be lanced. Maybe the ship
 Will take it away. A dripping sponge
 Mops at the blood. But an angel adjusts
 Its binoculars and all is recorded.
 The army marches after a mad owl.
 A sword burst into wild flowers, then flames,
 Then melts, pouring into a mould. A letter
 Dipped in ocean opens the two-faced door
 To the serpent's fang that sleeps hidden
 In a vial of tears wept by weeds.
 A skull referees for two madmen
 Fighting over a phantom ... two idiots
 Going off their heads in the front row.
 A water skeeter becalms the storm brewing
 Its pearl in the dregs of a teacup. A secretary
 Reads out the minutes to a row of tombs.*

**Poet Laureate Ted
 Hughes with a poem
 written to be
 forgotten - see the
 Memorial report.**

BRAIN CLUB NEWS

Dominant Dominic meets Layang Layang

Change of Name

As reported in the last issue of *Synapsia* a number of people who have joined have remarked that they would have joined more readily had they realised the nature and aims of the Club.

In university circles, James Lee has pioneered the use of 'Use Your Head' in the titles of groups or societies with a similar aim to our Club and following this lead we have decided to adopt that name ourselves. Thus from 1st January 1994, The Brain Club will be known as the Use Your Head Club.

Thames Valley Brain Cell

The first meeting of the Thames Valley Cell of the Brain Club was held at: Rank Xerox, Parkway, Globe Park, Marlow, Bucks on 23rd September 1993. This meeting coincided with the period when this magazine was being printed, but we hope to carry a report in the next issue. Meanwhile, anyone who is interested in developing and exploring their mental skills can contact The Brain Club at PO Box 1821, Marlow, Bucks SL7 2YW (tel: 0628 477004).

Somerset Brain Club

Lynn Collins reports that on July 18th the largest Brain Club gathering ever took place at the Brain Club Southwest's meeting at Greenham Hall, Somerset. Tony Buzan was guest speaker and held a record crowd of 96 people enthralled. It was a huge success for the Club, netting £100 profit and many new members; a memorable occasion for all concerned.

See next *Synapsia* for a full report.

World Memory Champions Meet The Memory Elephant

A meeting of brains was held in the Elephant House at London Zoo on Monday, 20th September 1993.

Following the World Memory Championship held in London recently, a distinguished group of memory champions, authors and experts on the brain came together to meet *Layang Layang*. At the meeting *Layang Layang* was officially named 'The Memory Elephant' on behalf of The Brain Trust, which has donated funds to sponsor research into the memory and intelligence of animals, especially elephants.

Layang Layang is a ten year old elephant who was found abandoned after her herd had been driven off a plantation in Malaysia and was brought to London Zoo in 1985. She loves attention and companionship and, according to her keepers, 'does have the memory of an elephant!'

David Wilkie, the Olympic Gold Medallist kindly donated the magnificent elephant trophy for the overall winner of the World Memory Championships. This award was presented by Tony Buzan to Dominic O'Brien, the recent winner.

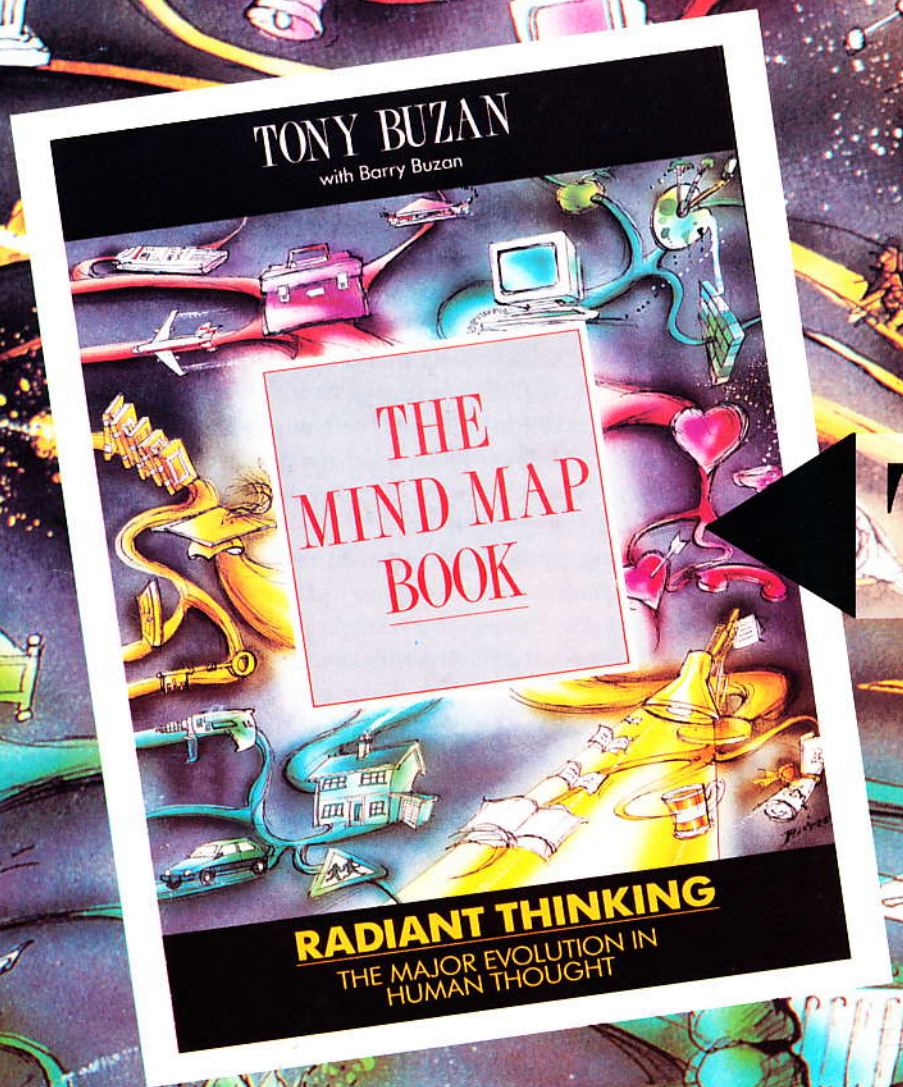
London News

Michael V. Roman-Pintilie reports that in July the London cell of the Brain Club was addressed by Tony Buzan, leading to an increase in the normal turn out of 20-25 to 52. Guest speakers included Ray Keene, Philip Bond, Jeff Malyon, Eugene Duvenard, James Lee and Vanda North and was a tremendous success. Future meetings are planned for 15th October, 12th and 19th November and 10th December. Please contact M. Roman-Pantilie at 93 Fox Lane, London N13 4AP (tel 081 886 7106) for further information.

BRAIN OF THE YEAR 1993

We welcome *your* suggestions.

UNLOCK THE POTENTIAL OF YOUR BRAIN



THE KEY

The Mind Map Book is published by BBC Books.

Hardback £16.99 ISBN 0563 36373 8

Available through good bookshops or by mail order (+£4 p&p)
from The Buzan Centre - ring 0202 533593

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