

# MAN VERSUS MACHINE

## Kasparov VERSUS Deep Blue



**DAVID GOODMAN AND RAYMOND KEENE**

**FOREWORD BY PATRICK WOLFF**

# **Man versus Machine**

## **Kasparov versus Deep Blue**

David Goodman  
Raymond Keene

H3 Publications  
Cambridge, Massachusetts • 1997

*Man versus Machine: Kasparov versus Deep Blue* by David Goodman and Raymond Keene.

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Editing by Byron Jacobs and Christopher Chabris, with Jason Luchan and Joel Salzman. Interior design and typesetting by B. B. Enterprises. Cover design by Ray Shell Design. Photographs by Rosa de las Nieves.

Manufactured in the United Kingdom by BPC Wheatons Ltd, Exeter.

Not for resale in Europe.

ISBN 1-888281-06-5

First Printing / May 1997

### H3 Publications

P.O. Box 382967 • Harvard Square Station  
Cambridge, MA 02238-2967 USA

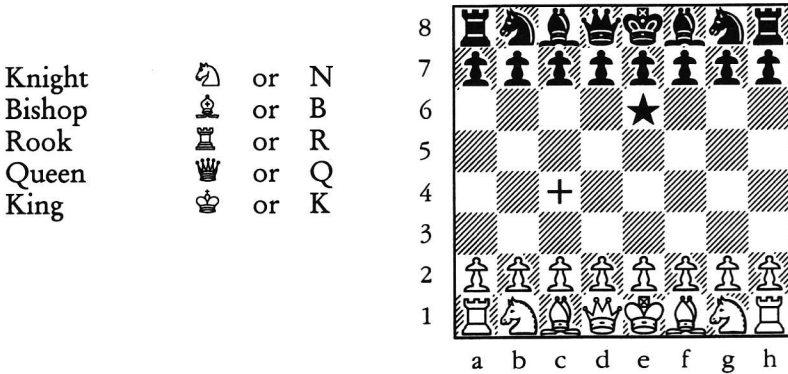
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# Contents

Chess Notation	4
Acknowledgements	5
Foreword	6
Welcome to the Machine	8
Deeper and Deeper	11
The Greatest of Them All	13
First Contact	17
A New Kind of Intelligence	27
This Time it's Personal	46
The Great White Hope and the Big Black Box	53
Game 1 – So Far, So Good	57
Game 2 – Tangled Up in Blue	64
Game 3 – Torturing the Toaster	72
How Do We Tell Garry?	78
Game 4 – The Thin Blue Line	84
Game 5 – Fear Itself	90
Game 6 – The Bluest Day	100
Look Back in Anger	107
Dream Team, Dream Machine: Why Deep Blue Won	122
The Human Dimension: Why Garry Kasparov Lost	124
Brave New Chess World	126

# Chess Notation

In writing down the moves, each piece is represented by a figurine as follows (we do not customarily use a special symbol for pawns when writing down the moves):



The squares on the chessboard are described by co-ordinates, consisting of a letter followed by a number (see diagram). For instance the square marked with a cross is called 'c4', the square marked with a star is called 'e6'. This follows exactly the same principle as reading a reference on an A-Z street guide. Everybody can pick this up easily. There is no mystery to it at all. Whenever a piece moves, the initial symbol of that piece appears at the start of the move. When a pawn moves, only the square on which it arrives, when the move is completed, is mentioned. Captures are denoted by an 'x'.

Note also the following special symbols:

...	Black move follows	!?	Interesting move
+	Check	?!	Dubious move
!	Good move	1-0	White wins
!!	Excellent move	0-1	Black wins
?	Bad move	½-½	Draw agreed
??	Blunder		

# Acknowledgements

*This book is dedicated to Samson Benen, Jonah Sampson Boyarin, Arun Gupta, Avery Halfon, Evan Rosenberg, and their families.*

The authors would like to thank the following people for their help:

Byron Jacobs of B. B. Enterprises for producing, typesetting and publishing this book and Christopher Chabris of H3 Publications for help in research and editing as well as publishing the North American edition.

Annette Keene for her patience and support; Patrick Wolff for help with chess analysis and for contributing the foreword; Stephanie Gutmann for use of computer and fax facilities, typing copy and running a thousand errands; Jason Luchan for invaluable research, for correcting the text of the closing news conference text from audio tapes, and for finding the exact wording of the *Star Trek* quote.

Rosa de las Nieves for her photos; Elliott Winslow for advice on computers and the Internet; Dan Edelman; David Levy; Stefan Löffler for analytical advice on the Philadelphia games; the public relations staff from TSI and IBM's T.J. Watson Research Center; and Leontxo Garcia, the hardest working man in the press room.

Larry Evans; Lev Albut; Joel Salman; Larry Lebow; Hope O'Connell; *Chess Life* Editor Glenn Peterson; *Chess Life* Assistant Editor John MacArthur; and James Saynor of BBC-TV.

Nick Conticello of the Manhattan Chess Club for transcribing analysis into ChessBase; Ron Young of the Marshall Chess Club; the staff of Herman S. Jaffe Inc. for transcribing tapes; Daniela Nuziu for taking text dictation, and Neil Benen for finding her at such short notice; Rick Derrickson for physical therapy; and Baskin-Robbins ice cream at the corner of 91st and Columbus.

Finally, thanks to world chess champion Garry Kasparov, the Deep Blue team, and Deep Blue itself, for playing this extraordinary match.

David Goodman and Raymond Keene,  
May 1997

# Foreword

The human animal is by nature competitive and comparative. Throughout our history we have measured our abilities by testing ourselves against nature, against other animals, and against each other. To this end, we have invented many sports, games, and contests. Surely there is no ability we treasure more highly than our intelligence, and that is why the game of chess – which has been called ‘the ultimate test of cerebral fitness’ – has a special place in our culture. To excel at chess one must be cunning, cold-blooded, and intellectually gifted. People spend the better part of their lives mastering strategies and training their minds simply to be able to defeat their rivals at this most difficult game.

Because the hallmark of chess is that it is a competition of the intellect, it has been assumed for centuries that only humans could compete in this arena. One may race against a horse, or pit one’s strength against the elements, but only humans possess an intellect, so only humans can play chess. But recently, another competitor has entered the arena of chess: the computer.

When a human plays a human, the competition is essentially personal and no more. But when a human plays a computer, the competition becomes more important. Now it is more than just a question of which player will win: it becomes a question of whether the computer can outperform the human at an activity that tests the one quality we identify with most strongly, our intelligence. And when the World Chess Champion, Garry Kasparov, possibly the greatest chess player ever to live, plays the fastest and most powerful chess-playing computer in the world, Deep Blue, the competition reaches the apex of its significance. Each combatant seems to stand as a representative for his (or its) group. *The competition transcends the mere question of which party will win this game, and becomes instead a*

question of whether the human intellect will still reign supreme in this realm.

One might protest that the computer is itself a creation of the human intellect. Fair enough, but that does not change the fact that it is the computer that makes the moves, not the computer's makers. We must measure ourselves against what we see, not what has made it. (Or otherwise, no human competition could have any significance; each of us was made by our parents and our circumstances.) Indeed, the protest may raise a deeper worry. Are we steadily building machines that will make us obsolete in every domain of the human intellect?

There are other points of protest to rebut this worry. The computer may excel at chess, but it cannot do many other things, both simple (like recognising faces), and complicated (like writing good poetry). And intelligence does not equal life, or self-awareness, so our fears of being supplanted may be ill-founded, because it would take more than intelligence to do so. I for one am not upset about the (almost certainly inevitable) prospect of the computer surpassing us in chess for any reason other than the vanity of wanting to be able to play chess better than any machine. However, I understand very well why this chess match attracts so much interest both from those who love chess and those who know almost nothing about the royal game. Both sets of people deserve a book that will explain the history of computers and chess, put the match in its proper perspective, report on the day-to-day events of the match, and explain the details of each game.

The authors have written such a book. Goodman and Keene are absolutely qualified to write the most objective and definitive book on the Kasparov-Deep Blue match, and they have done so. If this match at all interests or intrigues you, I am sure that you will love this book. Whether you have played chess for years, or whether you barely know how to play, this book will entertain you while giving you a deep understanding of every facet of this historic match. And if your love and appreciation for chess is similarly increased, then I know that the Kasparov-Deep Blue match will have enriched your life, as it has mine.

Grandmaster Patrick Wolff,  
two-times US Champion



# Welcome to the Machine

## How Computers Play Chess

*'I personally programmed the computer for chess, months ago. I gave the machine an understanding of the game equal to my own. The computer cannot make an error and assuming that I do not either, the best that could normally be hoped for is stalemate after stalemate. And yet I beat the computer five times. Someone, either accidentally or deliberately, adjusted the programming and therefore the memory banks of the computer.'*

– Mr Spock, from the *Star Trek* episode *Court Martial*, first broadcast February 2, 1967

Thirty years before Garry Kasparov sat down to face-off with Deep Blue in Manhattan, the notion of an all-seeing, invincible chess computer that could be defeated only by sabotage saved Captain Kirk's hide in an episode of the groundbreaking TV series *Star Trek*. By February 1996, fantasy had moved a little nearer to reality when Deep Blue, a supercomputer developed by IBM, beat Kasparov in the first game of a six-game series in Philadelphia.

Although Kasparov went on to win that match, it was clear that human intelligence was being challenged by a machine that seemed to transmute quantity of calculation into apparent quality of thought.

When a human plays chess, he or she looks at the position and considers various moves to play. Using what can be called common

sense, pattern recognition or intuition, the human mind rapidly homes in on a select few of the dozens of legal moves. There then follows analysis of some key variations, largely to confirm the initial judgement, before a move is finally chosen.

A computer like Deep Blue, however, does not have this luxury. When it plays, it must consider all the possible moves. A typical microcomputer program will look ahead several ply (or half moves), while Deep Blue, on average, searches exhaustively about 10-14 ply – five to seven full moves – ahead and can extend its search beyond that in many cases. What the computer lacks in human qualities, like judgement, it makes up for with extraordinary speed and accuracy. And the faster it calculates, the more positions it can consider and the deeper it can search.

At the end of each variation it considers, the computer ‘evaluates’ the position. An evaluation function gives numerical weight to all sorts of features, such as material, piece placement, pawn structure, and king safety. It summarises hundreds of these elements in a single number. Evaluation functions, which contain most of a program’s chess ‘knowledge’, were originally very simple, but are now much more complicated. The computer does its calculations and cold-bloodedly chooses the variation leading to the highest score.

The computer also has certain openings programmed into it that it will play on autopilot. Typically, a program will follow its book knowledge until it ends and only then will ‘wake up’ and start thinking for itself. Deep Blue is a bit more flexible, with both ‘forced’ and ‘optional’ book moves.

A great leap for computers would be toward searching selectively. Instead of exhaustively examining the consequences of all 40 or so legal moves in a position, a computer – rather like a human – would select the two or three most attractive ones and ignore the rest. Plans, goals and ‘strategic vision’ would be used to guide the selection process. But so far, attempts to make a computer think in this human way have not provided the payoffs gained from just speeding up and deepening the search and increasing the complexity of the evaluation function.

Even these sorts of improvements, however, are not easy to come by, especially at the already high level of Deep Blue. For example, how do you describe, in numerical terms, an elusive, but vital concept like piece activity? A program could count which player’s pieces

are attacking more squares, but that would be too simple a method in most positions, since not all squares are equally important. Putting ideas like this into an evaluation function is very hard.

Between the February 1996 and May 1997 matches the Deep Blue scientists worked steadily to solve these kinds of problems. But as Murray Campbell explained to the match audience, it is an impossible task to totally reduce a top chessplayer's intuition into a set of iron-clad laws. 'There are too many exceptions to too many rules,' he said.

As Garry Kasparov – that most human of champions – sat down to play Deep Blue on 3 May, somewhere in the back of his mind must have lurked the sense that it might be harder to win this time. The machine was certainly much better prepared. But whatever the result, this ultimate clash of styles would captivate the world for the next nine days.

# Deeper and Deeper

## A Brief History of Deep Blue

*'Chess is 30 to 40 percent psychology. You don't have this when you play a computer. I can't confuse it.'*

– Judit Polgar, 1993

The research which eventually led to the development of IBM's Deep Blue was begun in the mid-1980's at Carnegie Mellon University in Pittsburgh by a group of graduate students inspired by the work of Bell Laboratories scientist Ken Thompson, the first researcher to introduce the concept of specialised hardware and chips designed solely to play chess.

The students, who included 1997 Deep Blue team members Murray Campbell and Feng-Hsiung (F.H.) Hsu, called their first effort 'Chiptest'. Hsu worked on chess hardware and search; Campbell concentrated on software and chess knowledge. The next version, 'Deep Thought', introduced the idea of parallelism, or the concept of using multiple processors to search the tree of positions. The original Deep Thought had two processors working at once, which enabled it to analyse 750,000 positions per second. Its international chess rating was estimated at 2450. In 1988 Deep Thought defeated Danish grandmaster Bent Larsen in tournament play. In a 1989 match against Kasparov in New York, which it lost 2-0, Deep Thought had six processors and was capable of searching 2,000,000 positions per sec-

ond.

Around this time, Campbell and Hsu were hired by IBM to pursue this project further at their research centre in Yorktown Heights, New York. The effort later came under the leadership of Chung-Jen (C.J.) Tan, manager and spokesman for the Deep Blue project.

Joseph Hoane, Jr. and Jerry Brody, already at IBM, joined the team to work on software and hardware engineering respectively. Their collaboration led to 'Deep Thought II', a revision of Deep Thought using IBM hardware and a new chess chip.

A prototype using Deep Blue software ideas on Deep Thought II hardware defeated the Danish national team and Judith Polgar in separate matches in 1993.

Progress on a faster computer proceeded but Deep Blue itself technically only came into existence in the fall of 1995, when the team completed work on a chip capable of searching two to three million moves a second. In February 1996, this stronger computer, now renamed Deep Blue and upgraded to see even more moves per second, defeated Garry Kasparov in the first game of the ACM Chess Challenge held in Philadelphia. This was the first time a world champion had lost to a computer in a regulation game held under tournament time conditions and rules. But Kasparov fought back to win the series 4-2. Between then and the rematch, Deep Blue nearly doubled the speed at which it can analyse potential moves. The version of Deep Blue that faced off against Garry Kasparov in May 1997 was able to analyse about 200,000,000 positions per second.

Grandmaster Joel Benjamin, who briefly aided the IBM team before their 1996 match with Kasparov, was brought in full-time in September 1996 to take the computer to chess school in preparation for the 1997 rematch. Spanish GM Miguel Illescas and at least two other American grandmasters, John Fedorowicz and Nick de Firmian, joined the effort shortly before the match to help with final testing and preparation.

# The Greatest of Them All

*'I thought I was playing the world champion, not some 27-eyed monster who sees everything in all positions.'*

- Tony Miles, 1986

Garry Kasparov ranks, in the opinion of most experts, as the greatest human chessplayer of all time. After his two latest exploits, first prizes in the super-tournaments at Las Palmas, December 1996 and Linares, February 1997 his FIDE rating was predicted to soar to a virtually incredible 2820, the first time anyone had ever reached such exalted heights. Amongst human opponents, he stands supreme.

Kasparov was born in Baku, then the capital of Soviet Azerbaijan, on 13 April 1963. His chess talents were apparent at an early age and he received extensive coaching from the Soviet chess authorities. Successes were quick to follow. In 1980 he won the world junior championship, the following year he was equal first in the Soviet championship and thereafter he captured an entire sequence of first prizes in the world's major tournaments.

In parallel, Kasparov also set his sights on the world championship, which is decided in match play rather than tournament play. In 1984 he won through to become the official challenger for the title then held by Anatoly Karpov. In 1985 Kasparov became, at the age of 22, the youngest world champion in the history of the game. Since then, he has successfully defended his title three times against Anatoly Karpov and once each against Nigel Short and Viswanathan Anand.

## Highlights of Kasparov's Career

- 1975 Aged 12, wins the USSR junior championship.
- 1979 Wins first international grandmaster tournament at Banja Luka.
- 1980 Earns grandmaster title. Wins junior world championship.
- 1982 Qualifies for world championship candidates competition.
- 1984 Having defeated Beliavsky, Korchnoi and Smyslov, qualifies to challenge Karpov for the world title.
- 1985 Campomanes, President of the World Chess Federation, stops Kasparov's first world championship challenge versus Karpov 'without result'.
- 1985 Defeats Karpov in rematch to become, at age 22, the youngest ever world champion.
- 1986 Defeats Karpov in revenge match held in London and Leningrad.
- 1987 Ties match against Karpov in Seville, thus retaining world title.
- 1990 Defeats Karpov in New York/Lyon championship. Describes Karpov as 'my perpetual opponent'.
- 1993 Attains a rating of 2805, thus becoming the first player to breach the 2800 barrier. He wins the Linares tournament, then the highest ranked competition in the history of chess and successfully defends his world championship title against Nigel Short in London.
- 1995 Defeats Anand in New York to remain world champion.
- 1996 Defeats Deep Blue by 4-2 in Philadelphia.

The following two games are fine examples of how Kasparov has recently asserted his authority over his nearest rivals.

### Kasparov-Kramnik

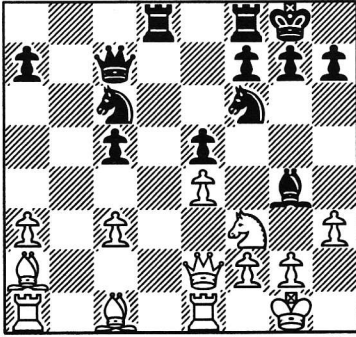
Linares 1997

*Nimzo-Indian Defence*

1 d4 ♘f6 2 c4 e6 3 ♘c3 ♙b4 4  
e3 0-0 5 ♙d3 c5 6 ♘f3 d5 7 0-0  
♘c6 8 a3 ♙xc3 9 bxc3 dxc4 10

♙xc4 ♖c7 11 ♙a2 b6 I think  
this is too slow. Black gains  
more active chances after the  
immediate 11...e5.12 ♜e1 e5 13  
e4 ♙g4 14 dxc5 A fine decision.  
With both sides having fractured  
pawns on the c-file, Black's

knights lack outposts, while White's bishop pair will soon have targets to attack. 14...bxc5 15 h3 ♖ad8 16 ♖e2



16...♙xf3 Kramnik is playing too rigidly for a draw by exchanges. This is quite out of his normal style, which is complex and aggressive. Here, for example, maintaining the pin by 16...♙h5 is more combative. 17 ♗xf3 ♜d6 18 ♙g5 h6 19 ♙h4 ♜fd8 20 ♜ab1 ♝e7 21 ♙c4 ♝c8 With the intention of blocking White's ambitions in the b-file after ...♝b6. Nevertheless, 21...♝g6 would have been more active. 22 ♙g3 ♝b6 23 ♙b5 ♜e6 24 a4 c4 25 ♖e2 ♜d3 26 a5 ♝c8 27 ♜b4 ♜xc3 28 ♜xc4 ♜xc4 29 ♗xc4 The exchange of weaknesses has left White with a clear advantage. Black's knights lack obvious perspectives, while White's bishops can potentially sweep the board. In particular, Black's pawn on a7 is a serious

long term weakness. 29...♗b8 30 ♗c5 ♝d6 31 ♙d3 ♝d7 32 ♗a3 ♝f8 33 ♜b1 ♗c7 34 ♜c1 ♗d8 35 a6 ♝g6 36 ♗c5 ♜e7 37 f3 A valuable move, defending the e4-pawn and preparing, at some future date, to redeploy the white queen's bishop to f2, targeting a7. 37...♝e8 38 ♙f1 ♜c7 39 ♗e3 ♜d7 40 ♙h2 Kasparov handles the final phase with superb restraint. There is no particular hurry to force the decisive invasion, and White's king is much safer on h2 than on g1. 40...♜e7 41 ♜c6 ♙h7 42 ♗c1 ♝c7 43 ♗c3 ♗d7 44 ♜c5 ♗d6 45 ♙f2 Perfectly timed and introducing the threat of ♜c6 which would win the a7-pawn. 45...♝e6 46 ♜d5 ♗b8 47 ♜b5 ♗d6 48 ♜b7 The writing is at last on the wall. Occupation of this outpost by White's rook spells certain doom for Black's a-pawn. 48...♝d4 Of course 48...♜xb7 49 axb7 leaves White with a winning passed pawn. 49 ♗b4 ♗f6 Naturally 49...♗xb4 50 ♜xb4 does not alter anything, since White's rook could easily repenetrate to b7. 50 ♗c5 ♝c6 Instead 50...♝xf3+ 51 gxf3 ♗xf3 would be pure bluff and fails, amongst others to 52 ♗e3. 51 ♙e3 Not even allowing Black a check on f4. 51...♜e6 52 ♙c4 ♜e7 53 ♙d5 Having reached this dominating square with his



bishop, Kasparov could be confident that Black's stubborn resistance would now promptly collapse. 53...♖d4 54 ♖xa7 ♖xa7 55 ♜xa7 ♗e7 56 ♔c4 h5 57 ♜c5 Black resigns There is no defence to the inexorable advance of White's passed pawn. This game was a classic textbook example of the superiority of two bishops over two knights in an open and stable position.

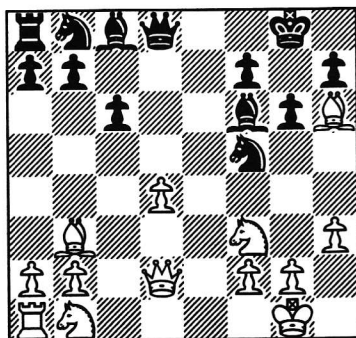
### Kasparov-Ivanchuk

Las Palmas 1996

*Alekhine's Defence*

1 e4 ♗f6 2 e5 ♗d5 3 d4 d6 4 ♗f3 g6 The modern way of handling this defence. Black develops his bishop on the flank and prepares to pummel White's extended pawn centre. 5 ♔c4 c6 6 0-0 ♔g7 7 h3 0-0 8 exd6 exd6 9 ♖e1 ♗c7 10 ♔g5 ♔f6 11 ♔h6 ♖e8 12 ♖xe8+ ♗xe8 13 ♔b3 A deep move, preparing to undermine Black's centre with c2-c4. The seemingly more natural 13 ♗c3 allows 13...d5 when the position really is level. 13...d5 14 c4 dxc4 15 ♔xc4 ♗d6 16 ♔b3 ♗f5 17 ♜d2 In order to retain an open diagonal for his bishop on b3, Kasparov has been obliged to render his d4-pawn defenceless. However, if Black takes it there is hidden compensation. For example, 17...♗xd4

18 ♗xd4 ♔xd4 19 ♗c3 with a powerful lead in development and many threats.



17...♗d7 18 ♗c3 ♗xh6 19 ♜xh6 The nagging pressure exerted by White's remaining bishop leaves Black far short of equality. 19...♗f8 20 ♖d1 ♔e6 21 d5 cxd5 22 ♗xd5 ♖c8 23 ♜e3 b6 24 ♗e5 A superb example of centralisation. White's forces are ideally placed to attack on either flank. 24...♖c5 25 ♗g4 ♔xg4 25...♔xb2 fails to 26 ♗df6+ while the alternative 25...♔xd5 26 ♔xd5 ♖xd5 27 ♖xd5 ♜xd5 loses after 28 ♗xf6+. 26 hxg4 ♔g7 27 f4 h6 28 f5 g5 29 ♜e2 ♗h7 30 ♗xf6 ♜xf6 31 ♖d7 The final reinforcement of White's attack along the a2-g8 diagonal. Once Black's pawn on f7 falls, his case becomes hopeless. 31...♖e5 32 ♖xf7+ ♜xf7 33 ♜xe5+ ♜f6 34 ♜c7+ ♔h8 35 ♔h1 a5 36 ♔e6 ♗f8 Black resigns

# First Contact

## Kasparov versus Deep Thought, New York 1989

*'Right now there is no limit, because I can win any challenge.'*  
- Garry Kasparov

Back in 1989 there was a different mood entirely. Kasparov had finally dispatched Karpov off to the Candidates matches, and saw this encounter with Deep Thought more as a show than a serious challenge. The time limit was a casual 90 minutes each for the whole game; the crowd sat a few yards from the champion. Kasparov's most recent public challenge had been an appearance on the NBC television show *Late Night with David Letterman* where Dave responded to 1 e4 with 1...a5, Garry frowned, and Dave took his move back and played 1...d5.

As for his opponent - Deep Blue was not yet blue, but Deep Thought, a joint project of a number of graduate students at Carnegie Mellon University of Pittsburgh. Feng-Hsiung Hsu's essential computer concept of hardware move generation was implemented, but on just one board, not the many-processor parallel version that Kasparov later faced with Deep Blue. And while Kasparov was making jokes at the press conferences, the team was still trying to squash computer program 'bugs'.

Game 1

Deep Thought-Kasparov

Sicilian Defence

1 e4 c5

The Sicilian Defence, the standard announcement by world champion and club player alike that they are 'out for blood' and trying to win even with Black.

2 c3

Instead of the most common 2  $\text{d}f3$ . In this line White heads for d2-d4 supported by a pawn. Typically this leads to more restrained and defined central play, that one might assume the computer handles better.

2 ... e6

In later years Kasparov became famous for his fanatical preparation for even exhibition matches, but here it is unclear whether this was pre-prepared: he had played this move before in tournament play when he met 2 c3 and it does lead to somewhat murkier pawn structures than the usual moves 2... $\text{d}f6$  or 2...d5.

3 d4 d5

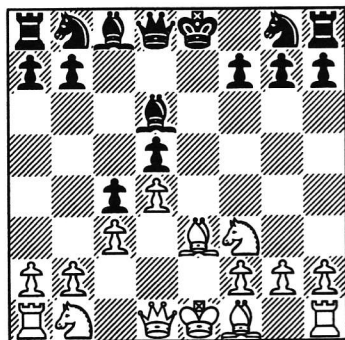
4 exd5 exd5

5  $\text{d}f3$   $\text{d}d6$

6  $\text{d}e3$  c4

The bold push that defines the game. Deep Thought could have avoided it by playing 6 dxc5, with one of those isolated d-

pawn positions where the good and bad squares are clarified. Instead, it gets drawn into an entirely different kind of game. Note 6...cxd4?! 7  $\text{d}xd4!$  with an unusual 'outpost bishop'.



7 b3 cxb3

8 axb3  $\text{d}e7$

In other games the knight has headed for f6, aiming at e4 and giving the d6 bishop more air, but Kasparov has things worked out.

9  $\text{d}a3$   $\text{d}bc6$

10  $\text{d}b5?!$

Deep Thought plays a connected series of moves, but they are seen to be too time-consuming.

10 ...  $\text{d}b8$

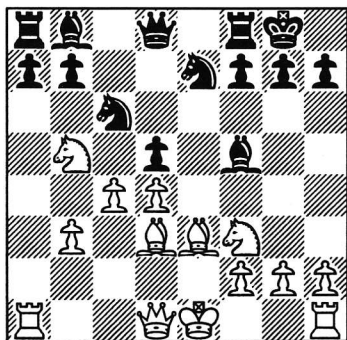
11  $\text{d}d3$   $\text{d}f5$

12 c4?!

This would be fine if Black had to trade on c4, but it never happens. Better to just play 12 0-0.

12 ... 0-0

next move was the key, after which he knew he would win.



13 ♖a4?!

And this move is really a bit much...

13 ... ♜d7

14 ♘c3 ♙c7

15 ♙xf5 ♜xf5

The pressure on d5 forces Black to take back with the queen, but he doesn't mind at all.

16 ♘h4?! ♜d7

17 0-0

Having misplaced yet another piece, White finally castles. This was later identified as the result of a bug in the Deep Blue code – losing track of when to castle.

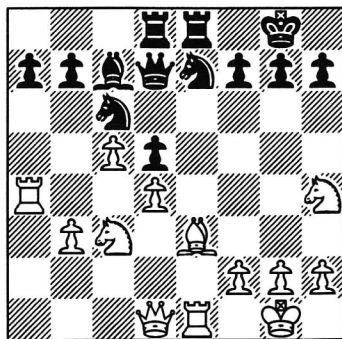
Meanwhile Garry just keeps turning up the pressure...

17 ... ♜ad8

18 ♜e1 ♜fe8

19 c5

What it was in this position that provoked Deep Thought to 'cave in' on the central pressure is not clear; in any case, Kasparov said after the game that his



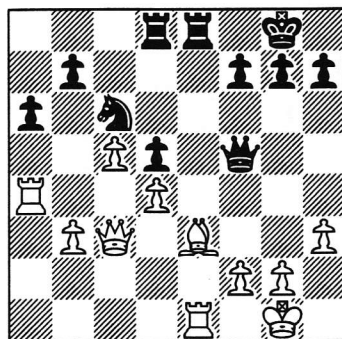
19 ... ♙a5!

20 ♜d3 a6

21 h3 ♙xc3!

22 ♜xc3 ♘f5

23 ♘xf5 ♜xf5



Black has implemented a standard stripping away of the 'other' minor pieces, leaving a classic 'good knight vs. bad bishop' position. Not to mention the respective rooks and queens!

24 ♜a2 ♜e6

20 Man versus Machine: Kasparov versus Deep Blue

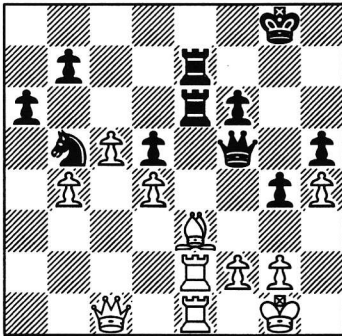
25 ♖ae2 ♜de8  
26 ♜d2 f6

Black prepares to advance his kingside pawns, not fearing an attempt at exchanging rooks (27 ♙f4? ♜xd4!). The computer is unable to wait patiently and begins to fidget.

27 ♜c3 h5  
28 b4 ♜8e7  
29 ♙h1 g5  
30 ♙g1 g4  
31 h4 ♜e4  
32 ♜b2 ♘a7

Not even the advance 33 b5 is possible.

33 ♜d2 ♜4e6  
34 ♜c1 ♘b5

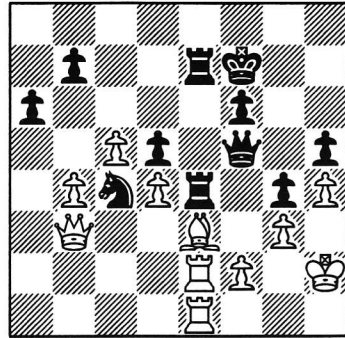


35 ♜d2?!

35 ♜b2! is stronger – there’s no reason to let the knight into an even better square without a fight.

35 ... ♘a3  
36 ♜d1 ♙f7  
37 ♜b3 ♘c4  
38 ♙h2 ♜e4

39 g3?



The last concession; 39 ♙g1 g3 40 f3? loses to three exchanges on e3 followed by ... ♜b1+, but 40 fxg3!? could fight on with 41 ♙f2 after either 40... ♜e6 or 40... ♜g4.

39 ... ♜f3  
40 b5 a5

So much for White’s counterplay. Now Black sends in the f-pawn and White position collapses like a stack of dominoes. Deep Thought’s controllers had decided to give up only when the computer evaluates the position as more than a rook down, even if this was vaguely insulting to the reigning world champion.

41 c6 f5!  
42 cxb7 ♜xb7  
43 ♙g1 f4  
44 gxf4 g3  
45 ♜d1 ♜be7  
46 b6 gxf2+  
47 ♜xf2 ♜xd1  
48 ♜xd1 ♜xe3

49 ♖g2 ♗xb6  
 50 ♖g5 a4  
 51 ♖xh5 a3  
 52 ♖d2 ♖e2  
 0-1

After the event Kasparov said 'In the first game I played quietly. In the second, I tried to crush it.'

Game 2

Kasparov-Deep Thought  
 Queen's Gambit Accepted

1 d4 d5  
 2 c4 dxc4  
 3 e4

For years, the main move here was 3 ♘f3 and then 4 e3, but grandmasters had already turned to the text move by the late 1980s. Coincidentally, it seems a difficult move for the computer to handle..

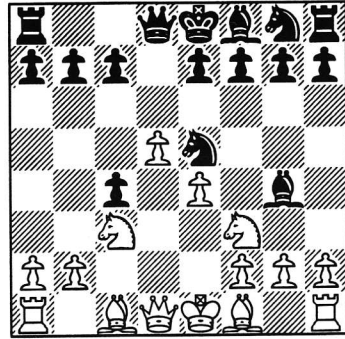
3 ... ♗c6

Deep Blue circa 1997 would do better with the lines after 3... ♗f6 4 e5 ♗d5.

4 ♗f3 ♖g4  
 5 d5 ♗e5

On the surface Black seems to be doing well; the queen's bishop is out, and White's centre has been compromised. But the totally undeveloped kingside is in danger of becoming a critical feature, and Deep Thought does nothing to deal with this.

6 ♗c3



6 ... c6?

6...e6 to develop the kingside, would make more sense. In fact, the rest of the game reads like a textbook on what not to do in the opening: exposing lines towards one's own king, moving the same pieces over and over, only to exchange them off, and premature development of the queen. In a game played only a few weeks later against the former world champion chess computer Hitech, Deep Thought tried 6... ♗f6. It is still in trouble, but its opponent then lost the thread and the game after 30 moves: 7 ♖f4 ♗fd7 8 ♖a4 ♗xf3+ 9 gxf3 ♖xf3 10 ♖g1 a6 11 ♖xc4 ♖c8 12 ♖g3 ♖h5 13 ♖h3 f6 14 ♖b4? (14 ♖e6) 14...g5 15 ♖e3 b5 16 ♖d4 c5 17 dxc6 ♖xc6 18 ♖xg5 fxc5 19 ♖xh8 ♗f6 20 ♖f1 ♖a5 21 ♖d4 ♖b4 22 ♖xf6 ♖xf6 23 ♖d1 ♖xd1 24 a3 ♖xb2 25 ♗xd1 ♖xa3 26 ♖xh7 ♖a5+ 27 ♖e2 ♖d6 28 ♖h5+ ♗d8 29

♖xg5 ♕h6 30 ♖g8+ ♔c7 0-1,  
Hitech-Deep Thought, 20th  
ACM tournament, Reno 1989.

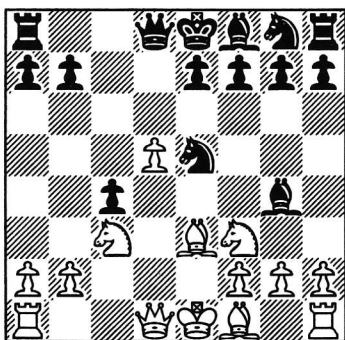
7 ♕f4 ♘g6

8 ♕e3!

Kasparov already sees that  
Deep Thought's king is stuck in  
the centre.

8 ... cxd5?!

9 exd5 ♘e5?!



10 ♖d4!

Giving up a pawn to further  
dominate the centre.

10 ... ♘xf3+

11 gxf3 ♕xf3

12 ♕xc4! ♖d6

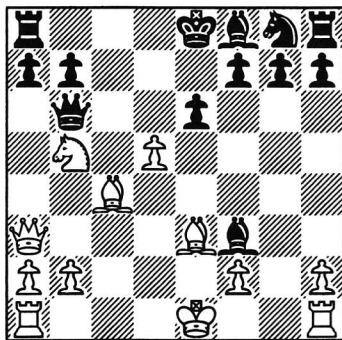
A better try was 12...a6, but  
after 13 ♖g1 White has an ex-  
tremely menacing position for  
his pawn.

13 ♘b5 ♖f6

14 ♖c5 ♖b6

Black's queenside folds up af-  
ter the alternative 14...♕xh1 15  
♘c7+ ♔d8 16 ♘xa8 ♖d6 17  
♖xa7.

15 ♖a3 e6



16 ♘c7+!

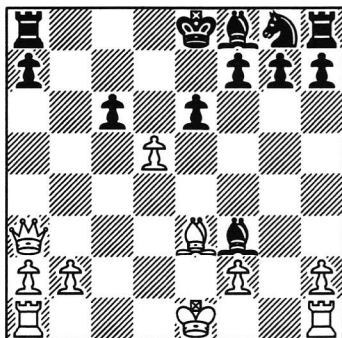
A nice combination that wins  
the queen. Deep Thought now  
achieves a relatively close mate-  
rial compensation, but Kasparov  
smoothly converts his develop-  
ment advantage into a win.

16 ... ♖xc7

The checks after 16...♔d8 17  
♖xf8+ ♔xc7 18 ♕xb6+ end it  
immediately.

17 ♕b5+ ♖c6

18 ♕xc6+ bxc6



19 ♕c5! ♕xc5

19...♕xh1 allows 20 ♕xf8, a

fitting resolution for the plan beginning on moves seven and eight.

- 20 ♖xf3 ♗b4+
- 21 ♔e2 cxd5
- 22 ♖g4 ♗e7
- 23 ♖hc1 ♔f8
- 24 ♖c7 ♗d6
- 25 ♖b7 ♗f6
- 26 ♖a4 a5

Allowing White to create a passed pawn through some pinning tactics.

- 27 ♖c1 h6

- 28 ♖c6 ♗e8
- 29 b4! ♗xh2
- 30 bxa5 ♔g8
- 31 ♖b4 ♗d6
- 32 ♖xd6 ♗xd6
- 33 ♖b8+ ♖xb8
- 34 ♖xb8+ ♔h7
- 35 ♖xd6 ♖c8
- 36 a4

Accurate to the end, Kasparov prevents the rook from getting behind the front a-pawn.

- 36 ... ♖c4
- 37 ♖d7 1-0

After this second victory Kasparov stepped forward and gave a speech that left members of the audience grinning. ‘OK, I did it well,’ he said to loud applause. ‘Before the first game I was a little bit worried because playing versus a human being, I have my opponent opposite me and its a kind of energy that goes between us. But today there was no human being and there was no energy. It’s kind of a black hole. But I discovered a new source of energy, because I was playing against a computer and the audience – human beings – everybody really wanted me to crush the computer, because we all, we have something in common, being human. And thank you very much for this enormous energy supply.’

The following year in February, ex-world champion Anatoly Karpov faced Deep Thought for the first time. Although he was successful in this game, victory was achieved only after the machine had spurned several chances to draw.

**Karpov-Deep Thought**  
Harvard University 1990  
*Caro-Kann Defence*

- 1 e4 c6
- 2 d4 d5
- 3 ♗d2 g6

This is a surprising move for

the computer. 3 ♗d2 is specifically aimed against any attempt by Black to play the systems with ...g7-g6 as White can now strengthen his centre with c2-c3.

- 4 c3 ♗g7
- 5 e5 f6

One would think that Deep



Thought would be afraid to undermine squares around its king.

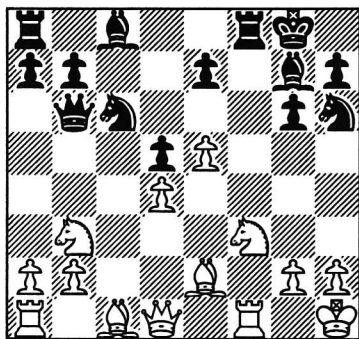
6 f4 ♘h6  
7 ♘gf3 0-0  
8 ♙e2 fxe5

Deep Thought spots a method of obtaining active counterplay.

9 fxe5 c5

This is based on the idea of 10 dxc5 ♘g4 with some advantage to Black. Also 10 dxc5 ♘c6!?

10 ♘b3 cxd4  
11 cxd4 ♘c6  
12 0-0 ♖b6  
13 ♚h1



White has problems in this position. His central pawn phalanx still survives Black's onslaughts, but the pawn on d4 is a major liability and his pieces neither co-operate well nor have good squares.

13 ... a5  
14 a4 ♙f5  
15 ♙g5

White intends to consolidate with ♖d2, but this move just

adds another to White's list of slight targets.

15 ... ♙e4

Black has at least equalised, and is probably better.

16 ♘c5

This is brave, but insufficient to yield White an edge if Black plays correctly. Black has applied immense pressure to White's centre and White can no longer make semi-passive moves and await ...♘f5.

16 ... ♖xb2

Alternatives to the text move such as 16...♙f5 are met by 17 ♖d2 when White has a large edge. But what about the exchange sacrifice 16...♘f5? After 17 ♘d7 ♖xb2 18 ♘xf8 ♘fxd4 White's position is hanging by threads. Black is temporarily a rook down, but he has threats of ...♘xe2, ...♘b3 as well as recapturing the f8-knight. How could Deep Thought, the tactician *par excellence*, have passed over such an opportunity? The lure of an easily edible pawn must have been too much of a temptation.

Karpov's next move introduces complications which are not particularly favourable for him. Perhaps he should have continued with the more strategic 17 ♘e6.

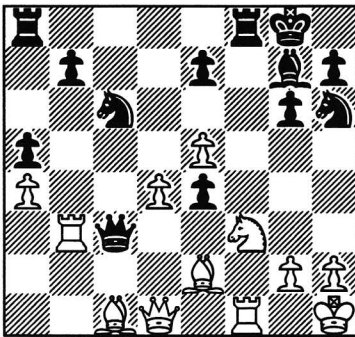
17 ♘xe4 dxe4  
18 ♙b1 ♖a3

Forced. Obviously 18...♖c3

would lose the queen to 19 ♖b3.  
18...♗a2 runs into 19 ♘d2.

- |    |     |     |
|----|-----|-----|
| 19 | ♙c1 | ♗c3 |
| 20 | ♙d2 | ♗a3 |
| 21 | ♙c1 | ♗c3 |
| 22 | ♖b3 |     |

Karpov was short of time and by repeating moves he could think while the computer's clock was running. Unfortunately for the computer it does not remember what it thought about before and must, therefore, re-think the whole position.



- |    |       |      |
|----|-------|------|
| 22 | ...   | ♗a1  |
| 23 | ♙c4+  | ♘h8  |
| 24 | ♙xh6  | ♗xd1 |
| 25 | ♙xg7+ | ♘xg7 |
| 26 | ♖xd1  | exf3 |
| 27 | gxf3  | ♖a7  |

According to Karpov, this was the only chance. However, according to eye-witnesses, the audience laughed when it appeared on the demonstration board.

- |    |     |     |
|----|-----|-----|
| 28 | ♙d5 | ♖d8 |
|----|-----|-----|

- |    |     |     |
|----|-----|-----|
| 29 | ♖b5 | ♖a6 |
|----|-----|-----|

The computer defends very resourcefully. Deep Thought now threatens 30...♘a7 31 ♙xb7 ♘xb5 32 ♙xa6 ♖xd4 with equality.

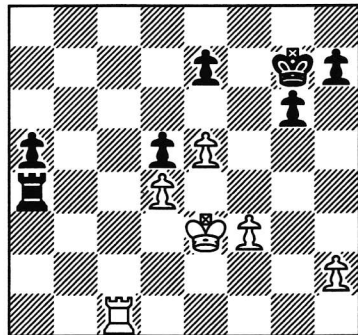
- |    |      |      |
|----|------|------|
| 30 | ♙c4  | ♖a7  |
| 31 | ♙d5  | ♖a6  |
| 32 | ♖c5  | ♖d7  |
| 33 | ♚g2  | ♖b6  |
| 34 | ♙xc6 | bxc6 |
| 35 | ♚f2  |      |

Risky, but Karpov still wants the full point. He should objectively have played 35 ♖xa5!

- |    |     |      |
|----|-----|------|
| 35 | ... | ♖d5! |
|----|-----|------|

Suddenly, if either party is better, it is Black!

- |    |      |       |
|----|------|-------|
| 36 | ♖xd5 | cx d5 |
| 37 | ♖c1  | ♖b4   |
| 38 | ♚e3  | ♖xa4  |



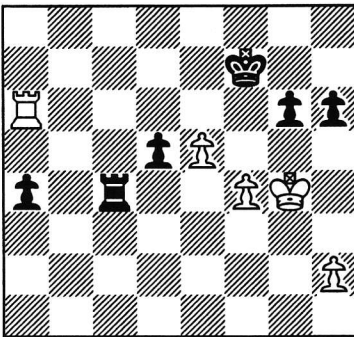
Deep Thought has defended itself with great skill and fully deserves to hold the draw which it could now have achieved with 38...♖b3+ 39 ♚e2 ♖b4 as White can hardly afford to give up his

d-pawn. Sadly, Deep Thought now mis-evaluates the position and embarks on some ill-advised winning attempts.

39	♖c5	e6
40	♗c7+	♕g8
41	♗e7	♖a3+
42	♕f4	♗d3
43	♗xe6	♗xd4+
44	♕g5	♕f7
45	♖a6	

Here there was a trivially easy draw to be had by 45...h6+ 46 ♕xh6 ♗h4+ 47 ♕g5 ♗h5+ 48 ♕f4 ♗f5+ and ...♗xe5.

45	...	a4
46	f4	h6+
47	♕g4	♗c4

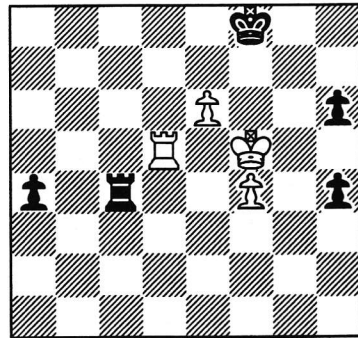


47...g5 was the final chance to draw but the computer still thinks it is up a pawn. Karpov, in the post mortem, stated that 47...g5 would probably draw.

48	h4	♗d4
49	♗f6+	♕g7
50	♗a6	♕f7
51	h5	

Deep Thought finally realises that it is worse. Still, 51...g5 offers many more chances than the text. Karpov thought he would still have had winning chances.

51	...	gxh5+
52	♕f5!	♕g7
53	♗a7+	♕f8
54	e6	♗e4
55	♗d7	♗c4
56	♗xd5	h4



Now there is a pawn race, but Karpov has expertly calculated that Black's far-flung cohorts cannot match his central legions.

57	♗d3	♕e7
58	♗d7+	♕f8
59	♗h7	h5
60	♕e5	h3
61	f5	♕g8
62	♗xh5	a3
63	♗xh3	a2
64	♗a3	♗c5+
65	♕f6	1-0

A point for Karpov but quite a moral success for Deep Thought.

# A New Kind of Intelligence

## Kasparov versus Deep Blue, Philadelphia 1996

*'I wonder what we were all worried about. I'll take my five positions per second any day, thank you.'*

– Viswanathan Anand

In 1996 Kasparov, despite a slow start, eventually won convincingly in a six-game match against Deep Blue. Over the first four games, Kasparov seemed to be struggling somewhat in adapting to what he termed the computer's 'style'. However, for games five and six, the champion adopted a different approach, inviting situations where the computer's main tactical strengths was subordinated to strategic insight.

This match created more public and media interest than any recent chess contest. The world champion's narrow escape and eventual victory against the machine certainly aroused more passions than his somewhat anodyne despatch of the Indian grandmaster Anand in their official world title clash in the fall of 1995.

In order to win, Kasparov had to curb his normal attacking instincts and love of open positions. The correct approach against computers it seemed, is to switch to a pythonesque strategy of strangulation and gradual attrition, as Kasparov eventually demonstrated.

Game 1

Deep Blue-Kasparov  
 Sicilian Defence

1 e4 c5

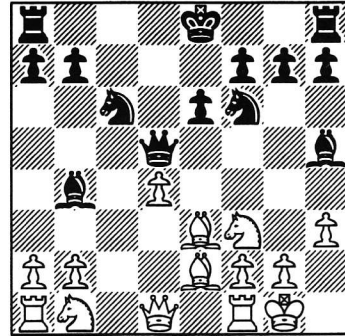
Kasparov heads for his favourite opening, the Open Sicilian after 2 ♖f3 d6 3 d4 cxd4 which leads to some tactics but also requires long-term strategic planning. That is why many computers are booked on systems with an early c2-c3 that lead to more open positions with lots of piece-play. So the next move comes as no surprise.

2 c3 d5  
 3 exd5 ♜xd5  
 4 d4 ♖f6  
 5 ♖f3 ♙g4

This system has become extremely fashionable. Black solves the problem of his light-squared bishop.

6 ♙e2 e6  
 7 h3 ♙h5  
 8 0-0 ♖c6  
 9 ♙e3 cxd4  
 10 cxd4 ♙b4!

Kasparov himself introduced this idea (although in a different move order: 8 ♙e3 cxd4 9 cxd4 ♙b4+ 10 ♖c3 0-0, Kramnik-Kasparov, Paris 1994). Unlike 10...♙e7, the bishop targets the e1-a5 diagonal, and may be transferred via a5 to b6, strongly increasing the pressure against the d4 pawn.



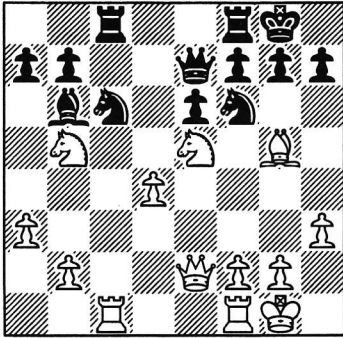
11 a3 ♙a5  
 12 ♖c3 ♜d6  
 13 ♖b5 ♜e7

13...♜b8?! invites the promising pawn sacrifice 14 d5 ♖xd5 15 ♙c5 ♙c7 16 ♜e1. Despite 25 minutes' thought, Kasparov did not find 13...♜d5, the most accurate continuation. In view of the positional threat 14...♙xf3 15 gxf3 White is virtually forced to repeat moves with 14 ♖c3. This was quickly realised by both teams after the game. Kasparov repeated the line in game three but Deep Blue's opening book was changed to 12 ♖e5. (without the moves 7 h3 ♙h5 interposed).

14 ♖e5 ♙xe2  
 15 ♜xe2 0-0  
 16 ♜ac1 ♜ac8  
 17 ♙g5! ♙b6

Black can't avoid the weakening of his kingside with 17...♜fd8 18 ♙xf6 ♜xf6 as 19 ♖xc6 ♜xc6 20 ♜xc6 bxc6 21 ♖xa7 leaves

White with an extra pawn.



18 ... ♖xf6 gx6

18... ♖xf6? 19 ♘d7 drops an exchange.

19 ♘c4! ♖fd8

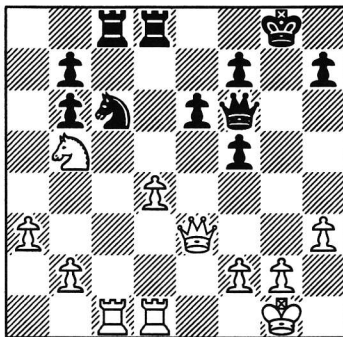
Of course not 19... ♘xd4?? 20 ♘xd4 ♖xd4 21 ♖g4+ and White wins a piece.

20 ♘xb6 axb6

21 ♖fd1 f5

22 ♗e3 ♗f6

Preparing to regroup with ... ♘c6-e7-d5, which Deep Blue prevents with a stunning, temporary pawn sacrifice.



23 d5!

An historic moment. Kasparov was so impressed with this move, he continued to refer to it in question and answer sessions during the 1997 rematch.

23 ... ♖xd5

24 ♖xd5 exd5

Now 25 ♗xb6 ♗xb2 would be silly. But:

25 b3!

'Kasparov missed quite a few moves today but this one in particular,' said David Levy after the game. Here the world champion started a long think but decided against 25... ♖d8! 26 ♗xb6 ♖d7 which would leave him with a defensible position, because of counterplay with the big passed d-pawn. After 27 ♖e1 d4 28 ♖e8+ ♔g7 29 ♗c5, Seirawan suggests the cool 29...d3 and if 30 ♗f8+ then 30... ♔g6.

25 ... ♔h8?

26 ♗xb6 ♖g8

27 ♗c5!

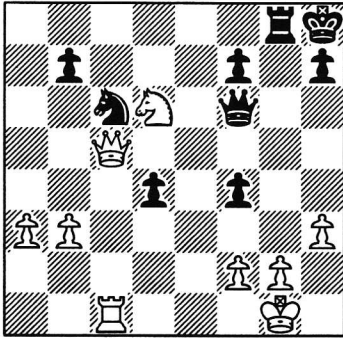
Simultaneously stopping the counter 27... ♗g5 and preparing the nasty 28 ♘d6.

27 ... d4

28 ♘d6 f4

When Joel Benjamin first saw this move he was shocked, and commentators began to wonder if Deep Blue hadn't seen the coming attack against his king? In fact, counterattack proves to be the strongest defence here and

Benjamin would soon regain a good deal of confidence in White's position.



29 ♖xb7! ♗e5

This threatens 30...♗f3+ 31 ♖f1 ♗d2+ and 32...♗xb3 winning the exchange or 31 ♖h1 ♗g6 mating respectively.

30 ♗d5 f3

31 g3 ♗d3

31...♗f4 would run into 32 ♖c8! (not 32 ♖h2 ♖xg3!!) and then even the marvellous trap 32...♗g5 fails: admittedly, if then 33 ♖xg8+ ♖xg8 34 ♗xd4 ♗c1+ 35 ♖h2 ♗f1 and Black mates, as indeed, after the move 33 h4 with 33...♖xc8! 34 hxg5 ♖c1+ 35 ♖h2 ♗g4+ 36 ♖h3 ♗xf2+. Much stronger is, however, 33 ♖c5! and White dominates.

32 ♖c7 ♖e8

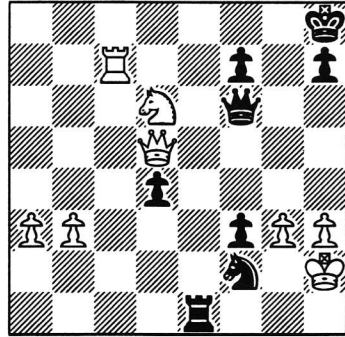
33 ♗d6 ♖e1+

34 ♖h2 ♗xf2

35 ♗xf7+ ♖g7

Of course 35...♗xf7 would not be answered by 36 ♗xf7??

♖h1 mate but 36 ♗xd4+ ♖g8 37 ♖c8+ ♖e8 38 ♖xe8+ ♗xe8 39 ♗xf2 ♗e2 40 ♖g1 with an easy win for White.



36 ♗g5+ ♖g6

37 ♖xh7+ 1-0

Kasparov didn't feel like seeing the trivial 37...♖g6 38 ♗g8+ ♖f5 39 ♗xf3.

### Game 2

#### Kasparov-Deep Blue Catalan Opening

1 ♗f3 d5

2 d4

Here Deep Blue started to calculate for several minutes, leaving observers wondering if the machine had been brought out of book so easily. The answer was no. When booting the system for the second round, somebody forgot to load in the opening database. Given that match rules forbid changes to the configuration during the games,

Deep Blue had to do without.

- |   |     |    |
|---|-----|----|
| 2 | ... | e6 |
| 3 | g3  | c5 |
| 4 | g2  | c6 |

White's move order is not supposed to be dangerous as 4...cxd4 5 0-0 f6 6 dxd4 e5 7 b3 e6! 8 g5 b7 equalises for Black.

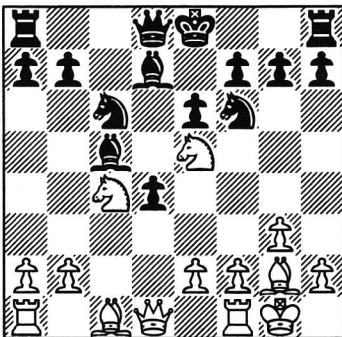
- |   |     |    |
|---|-----|----|
| 5 | 0-0 | f6 |
| 6 | c4  |    |

Now Feng-Hsiung Hsu picked up the c-pawn and traded it for White's d-pawn. It was only after the subsequent recapture with the knight that he realised he'd slightly misread the computer display. And the error was corrected.

- |   |     |     |
|---|-----|-----|
| 6 | ... | dx4 |
| 7 | e5  | d7  |

Of course not 7...dxd4? 8 e3 f5 9 xd8+ gxd8 10 xf7+.

- |   |      |     |
|---|------|-----|
| 8 | a3   | cx4 |
| 9 | axc4 | c5  |

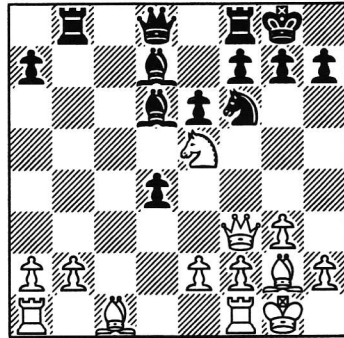


- |    |    |  |
|----|----|--|
| 10 | b3 |  |
|----|----|--|

The quickest way to regain

the pawn. 10...b8 11 f4 is out of question and 10...c8 11 f4 followed by 12 a1 gives White too much initiative. In 1985 Kasparov had used this line against the Swedish Grandmaster Ulf Anderssen, but seated in front of the computer, he couldn't remember how that game had continued. He later explained that he'd dropped the cautious Catalan from his repertoire several years earlier.

- |    |     |     |
|----|-----|-----|
| 10 | ... | 0-0 |
| 11 | xb7 | xe5 |
| 12 | xe5 | b8  |
| 13 | f3  | d6  |



- |    |    |  |
|----|----|--|
| 14 | c6 |  |
|----|----|--|

After much thought Kasparov decides against 14 f4 d5 15 dxd7 xd7 16 dx6 xd6 and 14 dxd7 xd7 15 g5 d5 which both pose Black little trouble. The text leaves White with no more than a minimal advantage. Not a bad result for the Deep Blue team given that



their creation was out of book at move one.

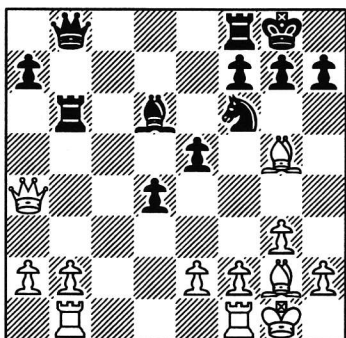
14 ... ♖xc6  
 15 ♜xc6 e5  
 16 ♖b1

16 b3 would weaken the c3 square.

16 ... ♖b6

Seirawan considers this move the first inaccuracy of the game. He prefers 16...♜d7 17 ♖g5 ♖fc8 18 ♜xd7 ♘xd7 19 ♖h3 ♖c7 20 ♖fc1 leading to a minute edge for White.

17 ♜a4 ♜b8!  
 18 ♖g5



Kasparov loves to sacrifice pawns – often a particularly effective strategy against a computer which tends to go for material gain and may underestimate long-term positional compensation. On this occasion, however, Deep Blue decides against grabbing the pawn because 18...♖xb2? 19 ♖xb2 ♜xb2 20 ♖xf6 gxf6 21 ♜d7 ♖b4 22

♖e4 gives White a dangerous attack.

18 ... ♖e7  
 19 b4!? ♖xb4?

Murray Campbell later suggested that the missing opening database may have taken its toll in an ironic way. As the computer had to find its early moves without the opening database, it had used more time than it otherwise might have up to this point. And its time management programs, Campbell said, may have prevented a deeper search. Campbell said that given more time Deep Blue might have decided against capturing with the bishop, but 19...♖xb4 20 ♖xb4 ♜xb4 (not 20...♖xb4 21 ♖b1 a5 22 a3) 21 ♜xa7 is not too pleasant an alternative. And the passed a-pawn is nicely supplemented by the bishop on the long diagonal.

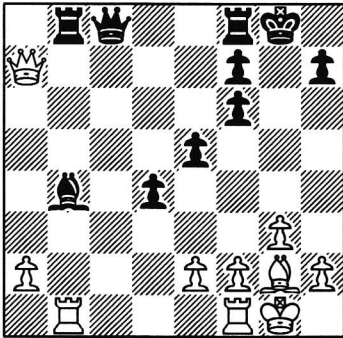
20 ♖xf6 gxf6  
 21 ♜d7 ♜c8

Black should not allow a battery of queen and bishop against h7.

22 ♜xa7 ♖b8?

It still isn't too late to trade queens with 22...♖a6 23 ♜b7 ♜xb7 24 ♖xb7 ♖b6 and White's edge may be hard to convert into a victory. Black is much more vulnerable with queens on the board, with an inevitable white attack against f7 and h7. Kas-

parov said after the contest that he made use of what he perceived as a Deep Blue aversion to queen trades.



23 ♖a4 ♕c3

Not great. The bishop is now cut out of the defence.

24 ♜xb8 ♖xb8

25 ♕e4

25 ♖c2 may be even stronger, e.g. 25...♖b2 26 ♖f5 ♔g7 27 ♕e4 ♜h8? 28 ♖g4+ ♔f8 29 ♖b1 winning.

25 ... ♖c7

26 ♖a6

Another inaccuracy: 26 ♜b1 is better.

26 ... ♔g7

27 ♖d3

After Deep Blue's 26th move Kasparov had only expected 27...h6. Otherwise he would have preferred 27 ♜b1 first.

27 ... ♜b8!

28 ♕xh7 ♜b2

29 ♕e4

After 29 a4 ♜d2 30 ♖e4 ♖c4

the white pieces, would start to get in each other's way.

29 ... ♜xa2

30 h4

Not best according to Seirawan. White should keep this square for his queen and first of all prevent the rook swap 30...♜a1.

30 ... ♖c8

31 ♖f3 ♜a1

32 ♜xa1 ♕xa1

33 ♖h5 ♖h8

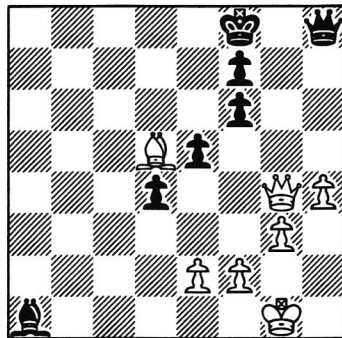
34 ♖g4+ ♔f8

35 ♖c8+ ♔g7

36 ♖g4+ ♔f8

Repeating moves to help reach the time control

37 ♕d5



37 ... ♔e7?

38 ♕c6 ♔f8

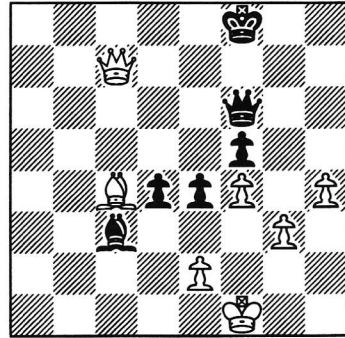
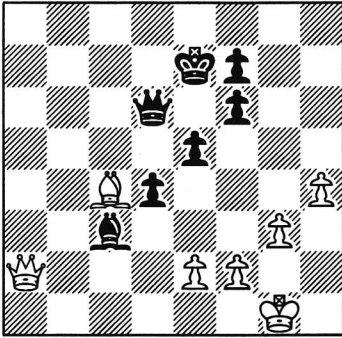
39 ♕d5 ♔e7

Instead of bringing its bishop back into the game, Deep Blue cluelessly moves back and forth. Now Garry has time to begin homing in on the f-pawn.

34 *Man versus Machine: Kasparov versus Deep Blue*

40 ♖f3 ♙c3  
 41 ♙c4 ♖c8  
 42 ♖d5 ♖e6  
 43 ♖b5 ♖d7  
 44 ♖c5+ ♖d6  
 45 ♖a7+ ♖d7  
 46 ♖a8 ♖c7  
 47 ♖a3+ ♖d6  
 48 ♖a2

55 ♙b5 ♙d2  
 56 ♖c7+ ♙f8  
 57 ♙c4 ♙c3  
 58 ♙g2 ♙e1  
 59 ♙f1 ♙c3  
 60 f4!



Fixing the f-pawn on a light square.

Done. Here is Black's last decent chance to transfer his king to where its needed with 48...♙f8 49 ♙xf7 ♙g7. Instead, with a pseudo-active pawn advance Deep Blue only weakens its own pawns.

48 ... f5?  
 49 ♙xf7 e4  
 50 ♙h5 ♖f6  
 51 ♖a3+ ♙d7  
 52 ♖a7+ ♙d8  
 53 ♖b8+ ♙d7  
 54 ♙e8+!

It makes sense to change diagonals to keep the black d-pawn tied.

54 ... ♙e7

60 ... exf3  
 61 exf3 ♙d2  
 62 f4 ♙e8  
 63 ♖c8+ ♙e7  
 64 ♖c5+ ♙d8  
 65 ♙d3 ♙e3  
 66 ♖xf5

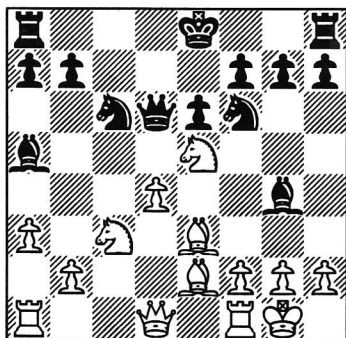
With three connected passed pawns Garry isn't too bothered any more about trading queens.

66 ... ♖c6  
 67 ♖f8+ ♙c7  
 68 ♖e7+ ♙c8  
 69 ♙f5+ ♙b8  
 70 ♖d8+ ♙b7  
 71 ♖d7+ ♖xd7  
 72 ♙xd7 ♙c7  
 73 ♙b5 ♙d6  
 1-0

'Unlike game one, today we had a chance to learn something about the weak points of Deep Blue,' said Murray Campbell.

Game 3  
Deep Blue-Kasparov  
Sicilian Defence

- |    |      |      |
|----|------|------|
| 1  | e4   | c5   |
| 2  | c3   | d5   |
| 3  | exd5 | Wxd5 |
| 4  | d4   | Qf6  |
| 5  | Qf3  | Qg4  |
| 6  | Qe2  | e6   |
| 7  | 0-0  | Qc6  |
| 8  | Qe3  | cxd4 |
| 9  | cxd4 | Qb4  |
| 10 | a3   | Qa5  |
| 11 | Qc3  | Wd6  |
| 12 | Qe5  |      |



12 Qb5 Wd5! is only good enough for a draw by repetition. Therefore Benjamin had prepared a different attempt but without enough time to check all the variations with Deep

Blue.

- |    |      |      |
|----|------|------|
| 12 | Qe5  | Qxe2 |
| 13 | Wxe2 | Qxc3 |

A necessity. 13...Qxe5 14 Qb5 (14 Qf4 Wxd4 15 Qxe5 Wd7 16 Wfd1 Wc6 17 Qxf6 gxf6 18 Qe4 looks nice too, but 14...Qf3+ 15 Wxf3 Wxd4 16 Wxb7 0-0 at least equalises for Black) 14...Wd5 15 dxe5 Wxe5 16 f4! gives White ample compensation: 16...Wb8 17 Qc5 Qb6 18 Wac1 or 16...Wb5 17 Qd6+ Qe7 18 Wxh5 Qxh5 19 Qxb7 Qb6 20 Qc5+ Qd7 21 Qxb6 axb6 22 Wfd1+ Qe7 23 Qd6.

- |    |      |      |
|----|------|------|
| 14 | bxc3 | Qxe5 |
| 15 | Qf4  |      |

Now both 15...0-0 16 dxe5 Wc7 17 exf6 Wxf4 18 fxg7 and 15...Wb7 16 Wxe5 0-0 17 Qg5 may be slightly unpleasant for Black. But he has better:

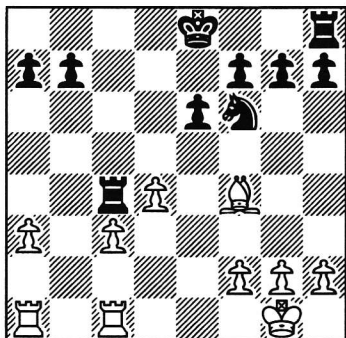
- |    |      |       |
|----|------|-------|
| 15 | ...  | Qf3+! |
| 16 | Wxf3 | Wd5   |
| 17 | Wd3  | Wc8   |

Benjamin had vaguely considered the possibility of 18 Qe5 coming up, but hadn't had those moves programmed in. And Kasparov has 18...Qd7 trying to lure White into 19 Qxg7? Wg8 20 Wxh7 Qf6 21 Wh6 Qh5 and the bishop is doomed.

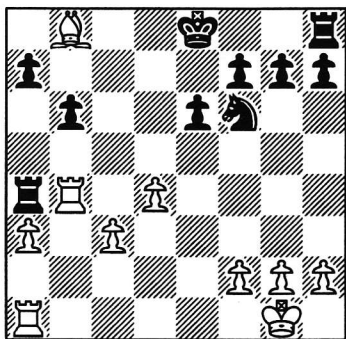
- |    |      |      |
|----|------|------|
| 18 | Wfc1 | Wc4  |
| 19 | Wxc4 | Wxc4 |

After an inferior opening, Deep Blue has reached a nearly lost endgame. Now the com-

puter finds a diabolically clever defence which, Kasparov suggested, no human grandmaster could have found. After the normal 20 ♖ab1 b6 White ends up with no counterplay and 21 ♙b8 would be nonsense because of 21...♞a4.



- 20 ♖cb1    b6  
 21 ♙b8    ♞a4  
 22 ♞b4



This is the point. Now White gets strong counterplay with its pieces.

- 22 ...    ♞a5

**23 ♞c4!?**

Garry had been expecting 23 c4 ♙e7 24 ♙e5 ♘g4! with strong play against White's hanging pawn pair, even if the light square blockade with ...b6-b5 and ...♙f6-d5 is no longer possible. Kasparov now evacuates his king away from the action.

His best chance may be 23...♙e7 because 24 ♞c7+? ♘d7 25 ♙xa7 is refuted by 25...♞a6! and White cannot avoid material loss. But Kasparov told reporters he didn't like the look of 24 ♙e5 ♞d8 25 ♞c6.

Another possibility for Black is 22...♞a6, which is far more effective against a possible 23 ♞c4. Unfortunately, it makes less sense against 23 c4, the move Kasparov considered White's most natural candidate move in the position.

- 23 ...    0-0  
 24 ♙d6    ♞a8

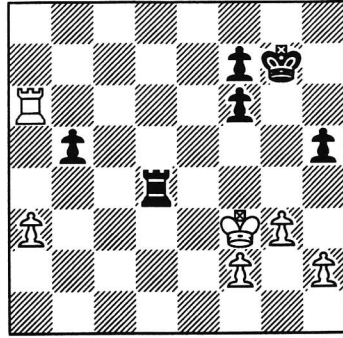
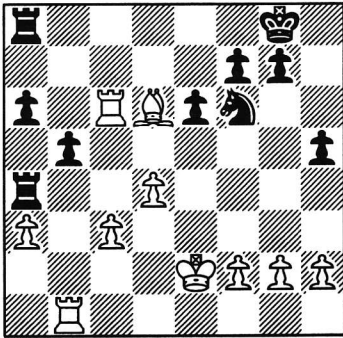
Garry says he didn't see enough winning chances in 24...♞d8 25 ♙e7 ♞e8 26 ♙xf6 gxf6 27 ♞c7.

- 25 ♞c6    b5  
 26 ♙f1    ♞a4  
 27 ♞b1    a6  
 28 ♙e2    h5

Kasparov later regretted this advance. He might have tried 28...h6, leaving his h-pawn less exposed or 28...♘e4, eventually threatening the manoeuvre

...♖a4-c4.

39 ♖xa6 ½-½



- |    |      |       |
|----|------|-------|
| 29 | ♔d3  | ♞d8   |
| 30 | ♙e7  | ♞d7   |
| 31 | ♙xf6 | gxf6  |
| 32 | ♞b3  | ♔g7   |
| 33 | ♔e3  | e5    |
| 34 | g3   | exd4+ |
| 35 | cxd4 | ♞e7+  |

Game 4  
Kasparov-Deep Blue  
Semi-Slav Defence

- |   |     |    |
|---|-----|----|
| 1 | ♘f3 | d5 |
| 2 | d4  | c6 |
| 3 | c4  | e6 |

A more amusing way to draw is 35...♞dxd4 36 ♖xa6 ♞e4+ 37 ♔f3 ♞f4+ 38 gxf4 ♖xa6. Kasparov was hoping for 36 ♔d3? ♞e1 swooping down on the d-pawn from behind.

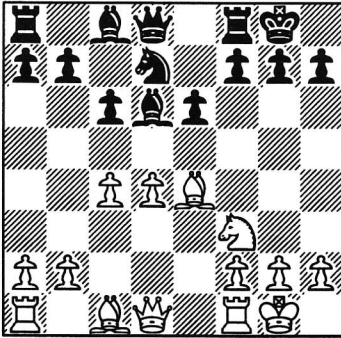
Heading for the popular and much analysed Meran System after 4 e3 ♘f6 5 ♘c3 ♘bd7 6 ♙d3 dxc4.

- |    |      |       |
|----|------|-------|
| 36 | ♔f3! | ♞d7   |
| 37 | ♞d3  | ♞axd4 |
| 38 | ♞xd4 | ♞xd4  |

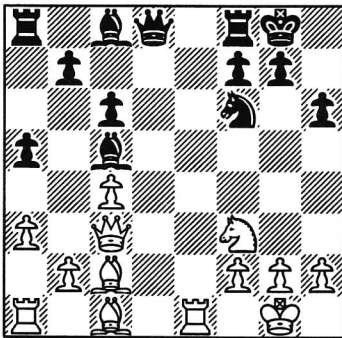
- |    |      |       |
|----|------|-------|
| 4  | ♘bd2 | ♘f6   |
| 5  | e3   | ♘bd7  |
| 6  | ♙d3  | ♙d6   |
| 7  | e4   | dx e4 |
| 8  | ♘xe4 | ♘xe4  |
| 9  | ♙xe4 | 0-0   |
| 10 | 0-0  |       |

When Campbell, who was operating Deep Blue, did not immediately accept his draw offer, Kasparov pointed out a few variations such as 39 ♖xa6 b4 40 a4 b3 41 ♞b6 ♖xa4 42 ♞xb3. Right after Deep Blue made its next move, Campbell's teammates called in to agree to share the point.

White stands slightly better out of the opening. Black wants to free its position with the advance ...e6-e5 but the immediate 10...e5? blunders a pawn due to 11 dx e5 ♘xe5 12 ♘xe5 ♙xe5 13 ♙xh7+ ♔xh7 14 ♞h5+ ♔g8 15 ♞xe5.



10	...	h6
11	♙c2	e5
12	♞e1	exd4
13	♜xd4	♙c5
14	♜c3	a5
15	a3	♞f6



White's pieces are nicely coordinated for a tactical strike against the machine with 16 ♙xh6. But Kasparov rejected the sacrifice which 'I would have played against any human' because he feared the computer's deep analytical resources.

However, his caution doesn't

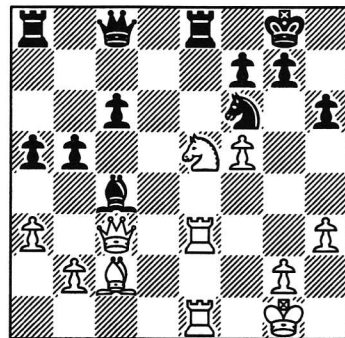
seem justified. With hindsight it was time for the human tactical genius to stop 'playing the man' and start 'playing the board'.

For example, 16 ♙xh6 gxh6 17 ♞ad1 ♘d7 (17...♜b6 18 ♜xf6 ♙xf2+ 19 ♚h1 ♙xe1 20 ♘g5! with a mating attack) 18 ♘e5 ♜h4 19 g3 ♙xf2+ with difficult play although White is better. Another defence is 16...♙xf2+ 17 ♚xf2 ♘g4+ 18 ♚g1 ♘xh6 but this is very good for White.

16	♙e3	♙xe3
17	♞xe3	♙g4
18	♘e5	♞e8
19	♞ae1	♙e6
20	f4	♜c8
21	h3	

This allows Black to get d5 for his its pieces. If White prevents it with 21 a4 Black can hold with 21...♙f5 22 h3 ♞e7 23 g4 ♙xc2 24 ♜xc2 ♜e8 planning 25...♘d7.

21	...	b5!
22	f5!	♙xc4



At this moment the connec-

tion between Philadelphia and Yorktown Heights was interrupted for 20 minutes and Kasparov became unnerved when Hsu and Campbell began discussing the problem right in the playing hall.

If 22...♙xf5 White can choose between 23 ♙xf5 ♖xf5 24 ♘xc6 and the probably winning 23 ♘xf7!

If 23...♙xf7? 24 ♖xe8 ♘xe8 25 ♙xf5 ♖xf5? 26 ♖f1 is hopeless or 23...♙xc2 24 ♘xh6+ ♙h7 (or 24...gxf6 25 ♖c2 ♙g7 26 ♖xe8 ♘xe8 27 ♖e7+ with a decisive attack) 25 ♘g4! and Black will lose back the piece in unfavourable circumstances.

Black's best seems to be 23...♖xe3 24 ♘xh6+ gxf6 25 ♖xe3 ♘h5 (after 25...♙xc2 26 ♖xf6 ♖f8 27 ♖xc6 White has more than enough for the piece) 26 g4 (or 26 ♖e5 ♙xc2 27 ♖xh5 with a strong initiative) ♙xg4 (after 26...♙xc2 27 gxf6 White's queen and rook are unstoppable) 27 cxb5 with a strong attack, e.g. 27...cxb5 28 ♙b3+ ♙h7 29 ♖e7+ ♙g6 30 ♙f7+.

23 ♘xc4

Kasparov decides against the pawn sacrifice 23 ♘g4 ♖xe3 24 ♘xf6+ gxf6 25 ♖xe3, preferring to stick with his safe edge.

23 ... bxc4

24 ♖xe8+ ♘xe8

25 ♖e4

The simple 25 ♖xc4 would have prevented Black from reorganising its forces.

25 ... ♘f6

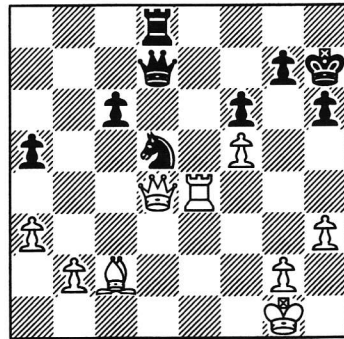
26 ♖xc4 ♘d5

27 ♖e5 ♖d7

28 ♖g4 f6

29 ♖d4 ♙h7

30 ♖e4 ♖d8



31 ♙h1?

Seirawan thinks that Kasparov may have been trying to avoid 31 ♖e6 ♖c7 32 ♖c5 ♘f4 33 ♖xc6 ♘h3+. But the text invites mating threats against his own king and hands over the initiative to Deep Blue.

31 ... ♖c7

32 ♖f2 ♖b8

33 ♙a4 c5!

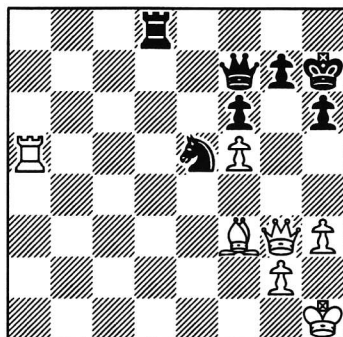
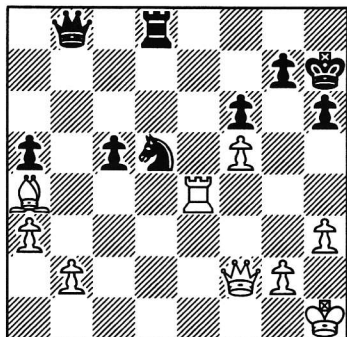
Here Garry realised that his planned reply 34 ♖e1 ♖xb2 35 ♙e8 runs into 35...♘f4! 36 ♖xf4 ♖xe8 37 ♖xe8 ♖c1+ 38 ♙h2 ♖xf4+ and Black wins. Even after 34 ♖xc5 ♖xb2 35 ♖xa5 ♘c3 36 ♖xd8 ♖b1+ 37 ♙h2 ♖xe4



40 *Man versus Machine: Kasparov versus Deep Blue*

White is hard pressed to parry the threats.

40 ♖a7 ♘e5  
41 ♖xa5 ♗f7



34 ♙c6 c4!  
35 ♖xc4

Black has a strong initiative after 35 ♖d4 ♗b6 36 ♙xd5 ♖xd5 37 ♖d2 (37 ♖f4 ♗d6) 37...c3! 38 bxc3 ♗b1+ 39 ♔h2 ♖xf5.

35 ... ♘b4!

Making use of 36...♖d1+.

36 ♙f3 ♘d3  
37 ♗h4

After 37 ♗e2 ♘xb2 38 ♖c1 ♘d3 39 ♖d1 ♗b3 White can't save his a-pawn, e.g. 40 ♗e3 ♘f2+ 41 ♗xf2 ♖xd1+ 42 ♙xd1 ♗xd1+ 43 ♔h2 ♗d6+. But Kasparov is ready to shed a pawn temporarily in a different way to create counterchances.

37 ... ♗xb2

Grabbing the pawn. Perhaps Deep Blue should have tried 37...♘e5, e.g. 38 ♖c2 ♘xf3 39 gxf3 ♖d1+ 40 ♔g2 ♗b5.

38 ♗g3! ♗xa3  
39 ♖c7 ♗f8

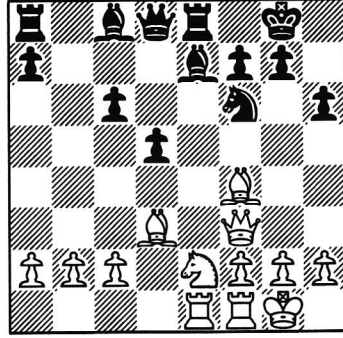
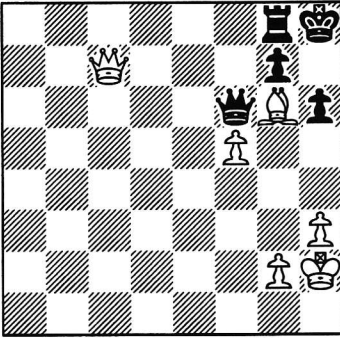
The Deep Blue team refused a draw at this moment, and Kasparov hunkered down into a deep 10-minute think. He possibly didn't like the look of 42 ♙e4 ♖d1+ 43 ♔h2 ♗c7 planning ...♖d4, so he sacrifices the exchange to relieve the pressure.

42 ♖xe5 fxe5  
43 ♗xe5 ♖e8  
44 ♗f4 ♗f6

The only chance to try for an advantage is 44...♔h8, both avoiding a later ♙g6+ and preparing ...g7-g5.

45 ♙h5 ♖f8  
46 ♙g6+ ♔h8  
47 ♗c7 ♗d4  
48 ♔h2 ♖a8  
49 ♙h5 ♗f6  
50 ♙g6 ♖g8  
½-½

Here the Deep Blue team gave up trying to push for a win and offered to share the point.



*Game 5*  
**Deep Blue-Kasparov**  
 Four Knights Game

- 1 e4 e5  
 2 ♘f3 ♘f6

A clever surprise, which Deep Blue chooses to parry by transposing into the Four Knights Game.

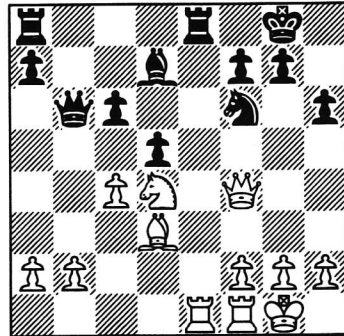
- 3 ♘c3 ♘c6  
 4 d4 exd4  
 5 ♘xd4 ♙b4  
 6 ♘xc6 bxc6  
 7 ♙d3 d5  
 8 exd5 cxd5

Many of us might have lurched at the chance to play 8...♙e7+ against a computer and trade queens.

- 9 0-0 0-0  
 10 ♙g5 c6  
 11 ♙f3 ♙e7  
 12 ♚ae1 ♚e8  
 13 ♘e2 h6  
 14 ♙f4

14 ... ♙d6  
 14...♙g4 15 ♙g3 ♙xe2 16 ♚xe2 ♘h5 17 ♙f3 ♘xf4 18 ♙xf4 looks drawish but may leave White with an edge as only it can create a kingside attack.

- 15 ♘d4 ♙g4  
 16 ♙g3 ♙xf4  
 17 ♙xf4 ♙b6  
 18 c4 ♙d7



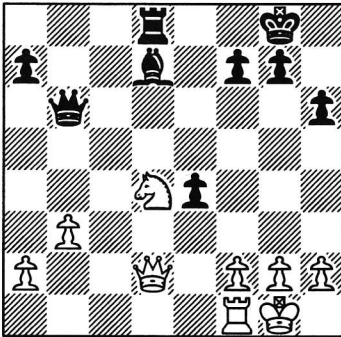
18...♙xb2 19 ♘xc6 dxc4 20 ♙xc4 ♙b7 is sufficient for a draw, though remaining with an isolated d-pawn is not dangerous for Black in this particular posi-

tion.

19 cxd5 cxd5  
20 ♖xe8+?

A mystery. Most human players would think twice about handing over control of the e-file to Black. Deep Blue is surprisingly off track here.

20 ... ♖xe8  
21 ♔d2? ♘e4  
22 ♙xe4 dxe4  
23 b3 ♖d8



After being handed the initiative over the last couple of moves Kasparov offered a draw, intending to go all out for a win with White in the final game. It was a brilliant tactical manoeuvre, because even though Deep Blue rated the black position superior by about a quarter of a pawn, the humans behind the computer were reluctant to give up their last chance with White and decided to play on. How could they know their creation had little clue how to continue?

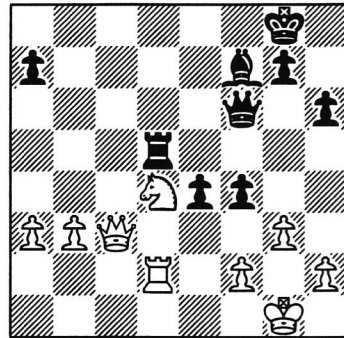
24 ♔c3?! f5  
25 ♖d1?! ♙e6  
26 ♔e3?! ♙f7  
27 ♔c3?! f4

Here Deep Blue's evaluation sank rapidly. White should have taken measures against the black expansion with g2-g3 and h2-h4 earlier.

28 ♖d2 ♔f6

Kasparov said afterwards that 28...♖d5 may have been more accurate than the text which allows 29 ♘e2 ♖xd2 30 ♔xd2 ♔a1+ 31 ♘c1 with drawing chances.

29 g3? ♖d5  
30 a3



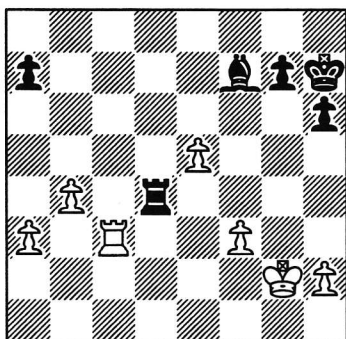
If 30 gxf4 ♔xf4 31 ♔e3 ♖g5+ 32 ♘h1 ♔g4 33 ♔g3 e3! the bishop will reign down a lethal check on d5.

30 ... ♘h7  
31 ♘g2 ♔e5  
32 f3

White's desperate measure against ...e4-e3 loses a piece.

32 ... e3  
 Even quicker would have been  
 32...♙h5 33 g4 ♙g6.

33 ♖d3 e2  
 34 gxf4 e1♚  
 35 fxe5 ♗xc3  
 36 ♖xc3 ♖xd4  
 37 b4



For a human, this move would be tacitly accepting defeat, as the only possible counterplay along the c-file can now be squelched.

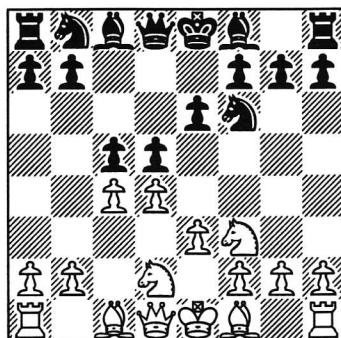
37 ... ♙c4  
 38 ♖f2 g5  
 39 ♖e3 ♙e6  
 40 ♖c3 ♙c4  
 41 ♖e3 ♖d2+  
 42 ♖e1 ♖d3  
 43 ♖f2 ♖g6  
 44 ♖xd3 ♙xd3  
 45 ♖e3 ♙c2  
 46 ♖d4 ♖f5  
 47 ♖d5 h5  
 0-1

A quietly triumphant Kasparov tapped his fingers together

a few times and even made a V for victory sign to convince Deep Blue's operator about the hopelessness of White's position.

Game 6  
 Kasparov-Deep Blue  
 Semi-Slav Defence

1 ♖f3 d5  
 2 d4 c6  
 3 c4 e6  
 4 ♖bd2 ♖f6  
 5 e3 c5



Between games this move was added to Deep Blue's opening book. The rationale behind it is that in similar positions white's knight is better placed on c3. However the extra tempo comes in handy for White in the set-up Kasparov has in mind.

6 b3 ♖c6  
 7 ♙b2 cxd4  
 8 exd4 ♙e7  
 9 ♖c1 0-0

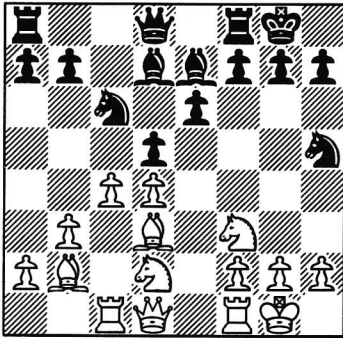
Resolving the tension.

10 ♖d3 ♗d7

Seirawan suggests 10...b6 as an improvement. White cannot punish this move immediately as 11 cxd5 ♖b4 solves Black's problems. The game might continue 11 0-0 ♗a6 12 ♖e1 ♖c8 with counterplay against c4.

11 0-0 ♖h5?

A premature attack that loses time with the knight.



12 ♖e1 ♖f4

13 ♗b1

Deep Blue's play would be justified after 13 ♗f1? ♖b4. But now 13 ♗b1 ♖b4 is answered simply by 14 ♖f1.

13 ... ♗d6

14 g3 ♖g6

15 ♖e5 ♖c8

16 ♖xd7 ♖xd7

17 ♖f3 ♗b4?!

Another aberration from the positionally uneven Deep Blue. Black should have tried ...dxc4 at some point to create play against the white centre pawns.

18 ♖e3 ♖fd8

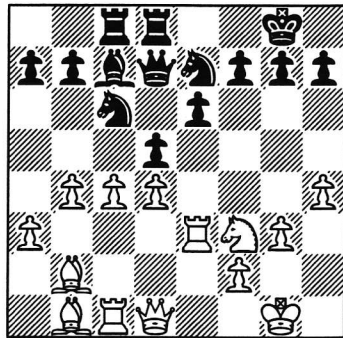
19 h4 ♖ge7

20 a3

Before typing in Kasparov's move Hsu forgot to activate the screen. So the first 'a' in 'a2a3' got lost and the rest turned out to be a message to the machine. It took about twenty minutes before play could resume.

20 ... ♗a5

21 b4 ♗c7



The standard sacrifice 22 ♗xh7+ ♖xh7 23 ♖g5+ ♖g8 (23...♗g6 24 ♖c2+ ♖f5 25 g4) 24 ♖h5 ♖f5 25 exd5 looks overwhelming, but Garry seems to be enjoying himself and continues in boa constrictor style.

22 c5 ♖e8

23 ♖d3 g6

24 ♖e2 ♖f5

25 ♗c3 h5

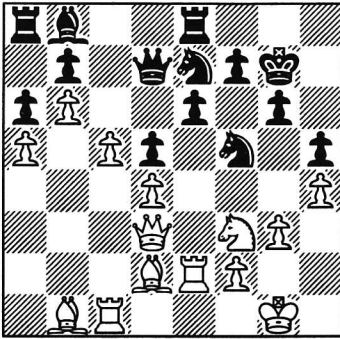
26 b5 ♖ce7

27 ♗d2 ♖g7

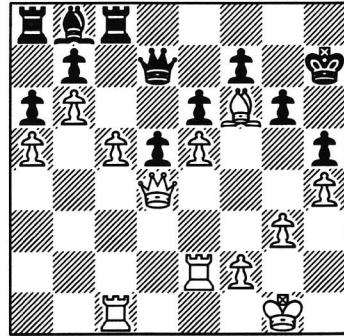
28 a4 ♖a8?

29 a5 a6?

30 b6 ♖b8?



35 ♖d4 ♖xd4  
 36 ♗xd4 ♗d7  
 37 ♙d2 ♚e8  
 38 ♙g5 ♚c8  
 39 ♙f6+ ♜h7



The last three moves speak volumes about the weak points in Deep Blue's evaluation function back in 1996. And the computer appears to underestimate the weakness of pieces which are locked out of play.

31 ♙c2 ♖c6  
 32 ♙a4 ♚e7  
 33 ♙c3 ♖e5  
 34 dxe5

Surprisingly, it took Deep Blue more than eight minutes to recapture the piece. Hans Berliner of Carnegie Mellon University guessed that this was due to a 'horizon effect'. Deep Blue may have realised just how bad its position was and searched in vain to come up with a way out of the box.

34 ... ♗xa4

40 c6!

The quickest solution. If 40...♚xc6 41 ♚xc6 ♗xc6 then 42 ♗b4 ♗c8 43 ♗e7 ♙g8 44 ♚c2 and White mates.

40 ... bxc6  
 41 ♗c5 ♜h6  
 42 ♚b2 ♗b7  
 43 ♚b4 1-0

Black is reduced to king moves and White can prepare a mating attack at his leisure.

And as the hundreds of fans whose 'dignity' he had promised to defend clapped and cheered, Kasparov thrust his arms triumphantly into the air.

	1	2	3	4	5	6	
Kasparov	0	1	½	½	1	1	4
Deep Blue	1	0	½	½	0	0	2

# This Time It's Personal

*'In 1972 Americans backed Bobby Fischer in his battle against the Soviet "chess machine". 25 years later they are supporting a Russian world champion against a real American chess machine.'*

– Leontxo Garcia

With *Newsweek* and *Harpers* match cover stories on newsstands and IBM ads featuring the memorable slogan 'How do you make a computer blink?' popping up all over Manhattan, Kasparov and the IBM team assembled two days before game one to meet the world's press. The organisers had expected a little over 100 journalists. What they got was around 200.

News conference host Monty Newborn, chairman of the ACM computer chess committee, opened proceedings with a statement from Mayor Rudolph Giuliani proclaiming 'the week of 3 May to 9th, 1997, in the city of New York as chess week.' Here is an edited version of what followed between Newborn, C.J. Tan and Kasparov.

*Newborn:* This contest may be a great chess match but it's also a great event in the history of computing. We have seen tremendous progress in the history of the use of our exciting tool and this event marks a real landmark in the advancement. I point out in 1958 when a computer first played chess, it was an IBM 704 and it played chess at a speed that was one million times slower than the computer that IBM will use today. One million times slower. Can you imagine if

your car was a million times faster than it was in 1958? And the amazing thing is that from where I stand, while it's gone by a factor of a million since 1958, it's not inconceivable that before my lifetime is finished, that we may see another factor of a million. It's an incredible progress in technology. And it's just a pleasure to be involved with it.

At this point I'd like to introduce Dr C.J. Tan, who is the head of the Deep Blue team. C.J. is a pioneer in the development of IBM's supercomputers. He's had the job of providing the leadership which has moved this project to the terrific point that it stands at today.

*Tan:* Since Philadelphia last year, the world of chess and technology and computers have never been the same. And we're really glad to be part of that. And since the match last year, not only has the computer improved, but also there were more kids in the United States attending the national elementary chess championships just a couple of weeks ago. So it has influenced education as well. Furthermore, Garry is in top shape ... so we are all ready for this rematch and I don't know how much Garry has been preparing for this, but we have been preparing since last February and we're ready to go. And so you will be seeing starting Saturday a different chess match at a very high level between us and Garry - both competing at the level that has never been seen before.

And the computer will still be the IBM RS 6000 SP supercomputer but the processor we'll be using will be twice as fast. This computer was originally developed together by scientists at IBM research laboratory and the IBM RS 6000 supercomputer division. And more than 2,000 of those computers are already installed around the world doing all kinds of applications. And this is not just about a chess match. This is really about the future. About how we will be using computers to help us live our lives in the future.

And this is a perfect example where you have Garry Kasparov, a superman or the superman of the chess world using his laptop, using his PCs, preparing for the match. And he told me what used to take him 15 days to analyse will now take him only 15 minutes. And sometimes even 15 seconds. And on the other hand we have the IBM RS 6000 SP supercomputer and its ordinary men. So it's really the men and machine together to solve this problem. And contrary to some of you who like to make it into a man versus a machine, I think you are seeing here a perfect model of the future. How man



and machine together will be able to solve complex problems. Not only that, if you look at a supercomputer today, I guarantee you it will become the PCs of tomorrow. So you are really looking at the future where we can use this technology not only in playing chess but extending that to other consumer worlds to help the ordinary people manage your financial data, manage your house, manage your children's education – and you will be able to communicate with everybody through the international web so the whole world will be a much smaller and more connected world as well.

...For this match Deep Blue will be able to look at – on average – more than 200 million chess positions per second. And so we have done a lot of tuning and we'll not only be able to look farther but will have more precise data and more precise capability for making more precise decisions. We also have been working with our grandmaster consultant, the former US chess champion, Joel Benjamin since August last year.

(Tan then introduced Dr Feng-Hsiung Hsu, Murray Campbell, Joseph Hoane, Jerry Brody and Joel Benjamin)

*Newborn:* It's now my pleasure to introduce to you the world chess champion, Garry Kasparov. He's considered by many to be the greatest player in the history of chess which is an incredible achievement and if anything, he may be getting better. He certainly has played some of the finest chess of his life in the last year, and is coming to this match in New York possibly at the absolute top of his career. He loves the game of chess, and he's a tremendously good sport.

*Kasparov:* When 15 months ago in Philadelphia at the Marriott Hotel, C.J. introduced me, I was in a different mood. I was laughing, joking. I expected a nice match but I had no doubts about its result. Today I'm no longer in laughing mood. I don't think it's time to laugh. It's very very serious work. C.J. has just stated that the computer that's going to play me in 48 hour's time is much stronger, it's faster and it knows more about chess than any other chess program in the history of chess computers.

I have no doubt about that. I have full respect for the team that have been working with Deep Blue and now Deeper Blue and I feel that if in 1989 when I first played Deep Thought, it was about fun. In 1986 in Philadelphia, it was more about science. I believe that at that time, C.J. and his team wanted to find out whether their scientific

conclusions were right and that Deep Blue could really play chess. This time it's no longer fun, no longer science. I think they want to win. (laughter) This is a competition, this is a challenge and I have to treat it very very seriously. Also I have to tell you that it's a very unusual challenge because since the age of 12 or 13 before any serious match, I have had an opportunity to look at least a few games of my opponents.

I could study my opponent, I could draw a game plan, a war plan and prepare certain surprises. Today I have to shoot in complete darkness. I don't think that any database in Pentagon is as well protected as Deep Blue because there's no information available and the little pieces that are thrown to the press, they probably can only scare me. That's the only purpose. It's a very exciting opportunity even to start preparation for the match because I have to make my own scientific work using my laptop, other PCs and to build up a simulator to understand what can I expect from Deeper Blue. But you know, if I want to check some crucial positions, and I have the most powerful chessplaying software on a Pentium Pro 200, I have to wait for about six, seven hours to get a response similar to what Deep Blue will make within two or three minutes.

It's very difficult to run through a whole game if you have to wait for so long to get a compatible answer. But anyway I also feel good. I think it will be different chess but I have no doubt that the net result will be the same.

In a brief ceremony, Kasparov chose a white baseball cap from one of two boxes, drawing the white pieces for the first game. When Newborn asked Kasparov to try on the hat he replied:

*Kasparov:* No, my head is too big. (Laughter)

The question and answer session then began.

*Question:* Dr Tan, algorithmically - how is this new Deep Blue different?

*Tan:* Basically we have improved the speed but there's no fundamental change to the basic algorithm. Of course we have added many other heuristics to it, made it much smarter, able to capture the expert's knowledge and made it very flexible. As you know, last time between games, Garry was able to identify our weaknesses and change his strategy. We have developed tools to allow us to change

some of the strategy between games.

Obviously we'll never be as smart and adaptable and flexible as Garry. But hopefully we can make up for that weakness by our speed, by the wonderful computer.

*Question:* Mr Kasparov, why are you so confident that you're going to win?

*Kasparov:* Well, I should be confident to match their confidence. No, I think it will be far more difficult this time because I'm facing a better machine and obviously they learned a lot from that match and it will be more difficult for me to expose the weaknesses of the machine and to benefit from them. I hope that there are generic weaknesses of every computer and it depends very much not on their ability to shift from one strategy to another, but on my ability not to lose concentration during the match.

If I'm able to play the chess that I hope I can, then I am sure I'll be the winner. It's more in my hands rather than theirs.

*Question:* Mr Kasparov, you referred earlier to the fact that you're in the presence of some true intelligence. Could you explain that a little bit?

*Kasparov:* Yes. I think we can hardly call it intelligence because we always believe that intelligence is something similar to our mind. But playing with Deep Blue, and other computers but mainly with Deep Blue, I can smell that the decisions that it's making are intelligent because I would come to the same conclusion by using my intuition. But if I use 90% of my intuition and positional judgement and 10% of calculation, and Deep Blue uses 95% of computation and 5% of built-in chess knowledge, and the result matches four times out of five, maybe we should talk about some sort of artificial intelligence.

*Question:* You just used the words smell and intuition. Is that what you have that you that the computer doesn't have?

*Kasparov:* Yeah, naturally. (Laughter) I think we all have a human ability to feel that something is right or wrong when we play chess or another game. And human chess is much more about positional judgement and intuition rather than about pure calculation. But Deep Blue could come to the same conclusion by foreseeing the consequence of that decision. Because in chess, most of the consequences of your decisions will come within four to eight moves. And Deep Blue now has the range to calculate the positions and see what's going to happen in five or six moves. And very often without under-

standing the negative sides of its decision, it can see the consequences and it will not go there.

Now I will not go there because I know it's wrong path. It will not go because it calculates and these billions and billions of calculations are at one point matching my intuition. It's very funny but it happens.

*Question:* Garry, how have you prepared differently for this match than the last one?

*Kasparov:* The difference is that I had no preparation for the first match. I had to improvise during the match and that was not easy after game one which was a very painful defeat. But I was quite lucky in game two – not only by winning the game, but also exposing a major weakness of the machine.

And I gained back my confidence and was able to build up a strategy that was sufficient. This time I'm trying to find out what I can expect in different types of position and also I am trying to figure out what kind of moves in these positions will be most unpleasant and most effective against the machine. I'm trying to build up a style that is very different from what I normally do against human players. Because I have to change my strategy very dramatically.

*Question:* It's been strongly suggested that it's just a matter of time before the best computers will beat the best humans. Do you agree?

*Kasparov:* I think that if it happens it doesn't mean that computers will find the secret of the game. The computer will always be beatable, in my opinion. But at one point the pressure on the human being could be overwhelming, you know. At one point, the errors that are inevitable with human games will lead to a defeat but even if you imagine the situation, it will not be 10-0 in the computer's favour. It will always be, you know, 6-4 in the computer's favour. The computer will win probably, it will happen, but it will still be vulnerable if the world champion or a top chessplayer is able to keep his concentration and be well prepared.

I think it's not about the computer calculating the game to the very end because it's scientifically impossible, but just about computers playing so well that humans will not be able to expose its weaknesses.

*Question:* How would you rate the contribution of Grandmaster Joel Benjamin? Would that be a decisive factor for IBM?

*Kasparov:* I can only judge that – not by the end of the match –

but at least in the middle of the match. I have to see a few games played by the machine. Last time it was really decisive when Joel refused my draw in the fifth game. (Laughter)

*Question:* When was the last time Deep Blue actually played another computer?

*Tan:* Well, we played for several months against all the possible chess computers we could get our hands on, but after a few months we just gave it all up because we consistently beat all the available chess computer programs.

*Question:* In tournaments?

*Tan:* The current version of Deep Blue has never played in a tournament, and the version of Deep Blue that played last year has never played in a tournament. So we have a disadvantage in a sense that the Deep Blue machine itself has never had any tournament experience – (Laughter) – not like the world chess champion.

*Kasparov:* I think that C.J. is very modest about this advantage. I think that if I could have my hands on six or eight games played by Deep Blue against other computers, I think I would be even more confident about the result of the match. If these games were available, my chances to find the weaknesses and build up the winning strategy would be much, much better.

And I mean I would love to see a couple of games by Deep Blue beating other machines. I think that if you ask my opinion about the possible results, I would say it's about 8-2 against the best chessplaying software on the Pentium Pro 200. But it's only my guess and – again – the games are not available.

*Question:* Dr Tan, you've been very lofty in describing what is going on here for the benefit of knowledge and science, but on a more emotional level, don't you just want to win?

*Tan:* Well if you can find any sports person that goes into a competition thinking he will lose or wants to lose, let me know. (Laughter)

# The Great White Hope and the Big Black Box

*'There's room in that box. If I were Garry, I'd make them open it up.'*  
– Mike Valvo

The Equitable Building is an imposing skyscraper located between Times Square and Central Park in the white hot centre of the city. The first thing one notices from the sidewalk on Seventh Avenue is the building's magnificent marble lobby, a soaring atrium space three stories high with a glass ceiling through which one can see the sky. But the most stunning element of the lobby is the massive pop art painting by Roy Lichtenstein, a huge cartoon-coloured rectangle, 68 feet high by 32 feet wide, suspended against a wall in the lobby's centre, a melange of bold, stylised shapes like the rays of the sun and a child's face.

After taking in the Lichtenstein – it is hard to miss – spectators first passed through metal detectors and a security check and either walked or took an elevator one flight down to the 480-seat auditorium. During every game this comfortable and modern space was filled with sold-out crowds and hordes of journalists snapping, scribbling and doing stand-up pieces in front of cameras.

The auditorium stage featured three huge projection screens against a backdrop of high-tech green. The monitor on the right displayed an overhead shot of the board and served as a record of the actual over-the-board position. The middle screen featured a computer graphic of a chessboard for on-stage analysis by commentators and a colour

coded display showing the Fritz chessplaying program's opinion of the game.

The screen on the left displayed a live video feed from the building's 35th floor where Kasparov was ensconced in a sound-proofed studio. For every game, Kasparov sat on the left side of the board with a member of the Deep Blue team always on the right. Sometimes the camera would zoom in for a close-up of Kasparov's face and when Kasparov paced, the relatively narrow dimensions of the set left him wandering directly towards the camera. On the right hand side of the board, a Deep Blue operator was seated next to a sleek, black, \$5,000 flat screen monitor used to watch Deep Blue's thought process and display the computer's desired move. It was a slightly surreal scene for a chess tournament. Here was Garry Kasparov – emotional, aggressive, intense, demonstrative – seated opposite scientists whose main thoughts were not even with the game at all, technical experts largely concerned with whether or not the computer would 'crash.' It was an equally surreal situation for a competitor so used to 'playing the man'.

The excellent commentary team featured the calm and soft-spoken former US champion Yasser Seirawan (who, as the panel's resident GM, was charged with providing many of the final chess judgements on the positions) IM Maurice Ashley (a flamboyant showman who helped bring excitement and emotion to the hall) and IM Mike Valvo (a computer expert who served as the team's cool and thoughtful elder statesman). The commentators on the stage were joined by a variety of guests, including Grandmasters Patrick Wolff and Roman Dzindzihashvili (popularly known as 'Dzindzi), Kasparov's adviser on computers, Frederic Freidel, and members of the Deep Blue team. The main commentators closely resembled a group of local TV news anchors, while Women's World Champion Zsuzsa Polgar was brought on to help break up the male domination.

The operation was backed by a team of stenographers just below the front of the stage who recorded all the on-stage happenings and commentary for IBM's website devoted to the match. In the style of a daytime talk show, roving assistants with cordless microphones took thoughtful questions from a diverse audience.

The guts of the IBM effort was housed on the 35th floor in a tightly corridors warren of offices and TV studios. Kasparov laboured each day in a relatively small room done up to look like a

study, with shelves of old law books, and homey touches like gilt-framed paintings of medieval scenes, a Persian rug, potted plants – even a model ship and wooden duck decoys. A few folding chairs were positioned in a dark corner of the studio, reserved for IBM dignitaries and Kasparov's mother, who attended every game. On the set, Kasparov sat in a studded leather armchair, next to a Russian Federation flag, while Deep Blue played under the American flag. The chessboard lay on a blue table next to an unusual Art Deco-style chess clock that Kasparov has been developing in association with the manufacturer Audemars Piguet. In pre-match discussions with the IBM side that were only resolved the day before game one, Kasparov insisted on using this prototype for the match. Match arbiter Carol Jarecki sat at a desk off to the right.

Backstage also held the 'operations' or 'war' room where members of the Deep Blue team sat to make sure the computer was functioning and to discuss the game. Though the programmers could make no adjustments to Deep Blue's calculations during a game, the monitor screens (filled with continuously scrolling lines of computer output) were a window into the moves Deep Blue was considering. Since the team was allowed to 'tweak' the programming between rounds, a real chessboard sat on a table in the war room so that team members could analyse the games, test moves for themselves and plot programming and opening refinements.

Down a winding, low-ceilinged, serpentine hall filled with an ominous hum of electronic equipment, was the star itself. After all the media build up, the actual computer, an IBM RS/6000 SP with a special chess processor, was somewhat less imposing than the HAL-like monolith one might expect. The real Deep Blue resembles 2001's infamous computer only in that its two twin slabs are monolith-shaped and black. Each slab was covered with ventilated, black metal, and sat some inches off the floor on a blue pedestal. Contrary to the science fiction movie imagery, no red HAL-like electronic eye peers out, and there are no blinking lights – not even a discernible noise. Deep Blue, whose RS/6000 SP host is already widely used by outfits such as Lloyd's of London and the Lawrence Livermore National Laboratory, is a modest creature and a bit of a drone, a workhorse. Its next career move, according to publicity hand-outs, will be to the field of pharmaceutical design.

Back in the auditorium and towards the front of the stage on the



right side, the organisers had placed a life-size model of one of the Deep Blue slabs which audience members compared to a rock concert amplifier or a massive filing cabinet. The ominous presence of the 'black box' on stage fulfilled its dramatic intent nicely. Indeed, during the fifth game Valvo half-seriously suggested that the chess genius of the future might be some kind of half-man, half machine combination - a cyborg. Referring to the famous chessplaying automaton 'The Turk' that was found to have a man hidden inside, Valvo joked 'There's room in that box [for a hidden man]. If I were Garry I'd make them open it up.' This in turn led to a host of press room jokes about which GMs might fit in the machine. Would Karpov have to go on a diet? Would Kramnik have to cut his hair? And would Dzindzi make it in at all?

Every so often during games, one of the on-stage commentators would make a foray up to the press room on the 49th floor and seek out comments from strong players who were analysing the positions. The press corps were originally assigned to an elegant suite of three rooms, but as the number of journalists just grew and grew we were moved up to an even grander location on the 50th floor with stunning views that included a wonderful panorama north across Central Park. Perhaps the only absurdity in the press arrangements was IBM's decision to have a publicist sit in on all interviews with anyone from the Deep Blue team. That led to the occasional ridiculous situation, when a reporter, who has known Joel Benjamin for years, conducted a brief interview with him, an IBM-hired 'minder' sat in on the conversation, even when it ventured into algebraic notation.

Journalists were able to follow the on-the-board scenes and on stage analysis from two sets of large video monitors, but with the added advantage of being able to discuss the games with a roomful of colleagues. As 3.00p.m. approached, grandmasters took up positions in front of their TV screens, Ashley, Seirawan and Valvo were introduced to the crowd, the auditorium filled to capacity and chess fans around the world prepared to follow the moves on the Internet. It was time. And as all eyes turned to Kasparov and the new improved 'Deeper Blue', the question remained: Could Garry do it this time?



□ Kasparov ■ Deep Blue  
**Saturday, 3 May**  
**Réti Opening**

**So Far, So Good**

*'We have some work to do tonight.'*

- Murray Campbell

With the sparring finally over, Garry Kasparov opened the bout with a convincing victory over Deep Blue. Furthermore, the world champion overwhelmed his adversary in a scrappy, tactical battle that observers couldn't help fearing would favour his opponent. Playing White in a double fianchetto variation of the Réti opening, Garry ingeniously tricked the computer with a subtle, creeping move order. Deep Blue replied with a series of unusual moves – a slightly strange bishop retreat on move 12, followed by a ...g7-g5 pawn advance. With both kings castled on the kingside, Black advanced again with ...g5-g4, then lashed out at move 28 with another kingside pawn thrust.

As Black tried to rip open the white fortress, Miss Russia 1994 Anna Malova came into the press room as a guest of GM Lev Alburt. 'I'm sending good positive energy to help Garry to win,' she said. Her optimism wasn't completely shared by a group of titled players, feverishly analysing the current position on the opposite side of the room. The switch to tactics created an almost knee-jerk feeling among experts that the world champion had lost control of the position.

But Kasparov kept his cool. From the 30th move, he sacrificed the exchange, traded queens to neutralise any counterplay, and smothered Black by advancing a crushing wonderwall of kingside pawns.

‘At least I’ve found some faults (with Deep Blue) today,’ an exuberant Kasparov said after the game, noting that only White’s pawns – and none of his pieces – crossed the fourth rank ‘I kept my promise before the match that I would not play as Garry Kasparov normally plays in human events.’

But the world champion was careful to inject a note of caution. ‘It’s very, very tough and I hope I could spare some of my efforts for future games because if we keep playing the same pace, it will be tough for me.’

Few, however, were listening too closely. Indeed, as chess fans began to leave the hall and make their way home, many wondered whether Kasparov wouldn’t indeed trounce Deep Blue this time. ‘I told you I’d bring him good luck today,’ said a beaming Malova. Meanwhile, observers in the press room were pretty much blown away by Kasparov’s ability, not only to adapt to a more positional style, but also outplay the computer in complications. It seemed so reasonable when grandmasters began predicting a Kasparov victory of 4-2 or more. After all, who could have guessed the extraordinary events that were to come in the next two days?

*Game 1*  
**Kasparov-Deep Blue**  
 Réti Opening

1 ♖f3

The ideal opening against a computer. White develops a piece and yet does not declare his intentions in any irrevocable fashion. A key point of White’s opening strategy will also be to maintain a maximally flexible pawn structure.

1 ... d5

Black plays a normal reply, offering transposition to a Queen’s

Gambit.

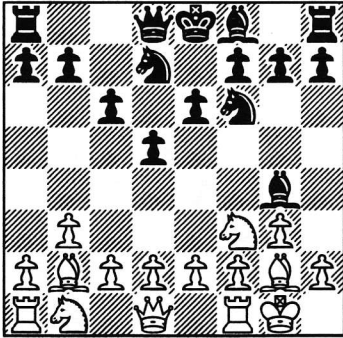
2 g3 ♗g4  
 3 b3

Quite consistent with his first move. Kasparov develops both bishops on the flank, and refuses to commit his central pawns too early.

3 ... ♘d7  
 4 ♗b2 e6  
 5 ♗g2 ♘gf6  
 6 0-0 c6

Black constructs a seemingly fireproof central pawn constellation, while simultaneously striving to maintain free play for its

minor pieces.



- 7 d3 ♘d6
- 8 ♖bd2 0-0
- 9 h3 ♘h5
- 10 e3

White begins to creep forwards. In contrast 10 e4 immediately would declare his hand prematurely.

- 10 ... h6
- 11 ♔e1

On e1 the queen unpins the king's knight and still reinforces the idea of e3-e4.

- 11 ... ♗a5

A decentralising move with the shallow threat of ...♘b4, which Kasparov easily parries. The explanation for this move may be that Deep Blue is programmed to look for space to operate in, hence this choice rather than the usual ...♗e7 development.

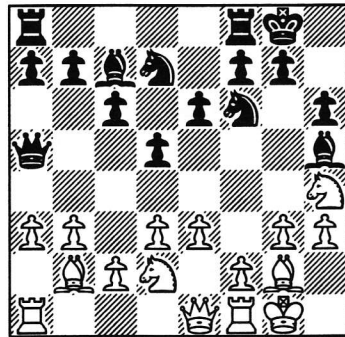
- 12 a3 ♘c7!?

A weird move by the machine, which only seems to

block the retreat of the black queen. This is the kind of error which had led most people to conclude that Deep Blue would be at a disadvantage on strategy-orientated situations.

- 13 ♖h4

Kasparov's idea is to introduce the possibility of f2-f4, expanding on the kingside.



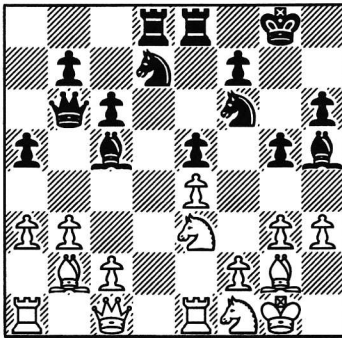
- 13 ... g5

A strategic blunder. It is simply impossible to wreck one's pawn structure like this in front of the king and Kasparov greeted this move with barely concealed mirth. Left to its own devices, though, and bereft of the crutch of opening theory, this is the kind of space and time-gaining ploy that the computer will indulge in, regardless of the long-term strategic perils.

- 14 ♖hf3 e5
- 15 e4 ♗fe8
- 16 ♖h2 ♗b6
- 17 ♗c1

The safety first measure 17 ♖h1 looks preferable. Kasparov now evolves a long range plan to seize control of the weakened f5 square with his knights. Nevertheless, this plan of campaign consumes much time and allows Deep Blue to stir up all sorts of tactical complications.

- |                 |      |      |
|-----------------|------|------|
| 17              | ...  | a5   |
| 18              | ♞e1  | ♙d6  |
| 19              | ♜df1 |      |
| En route to f5. |      |      |
| 19              | ...  | dxe4 |
| 20              | dxe4 | ♙c5  |
| 21              | ♜e3  | ♞ad8 |
| 22              | ♜hf1 |      |



22 ... g4?

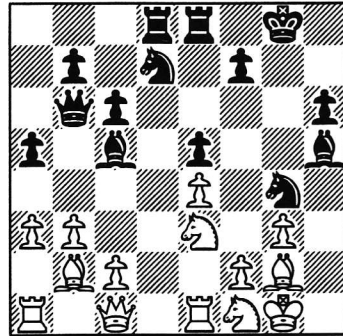
A few observers at first thought this advance which weakens further Black's structure to gain piece activity might be justified, but it is just too weakening. After the game, Kasparov called this move 'the big mistake. That move gave me a lot of pleasure'. Black should try

22...♙g6 to defend f5.

23 hxg4

Unnecessarily speculative is 23 ♜f5 ♙xf2+ followed by ...♙g6.

23 ... ♜xg4



24 f3

After the move 22...g4 one of the light bulbs above Kasparov's head exploded. At the time observers noticed some unusual reactions at the board, but with no sound feed from the studio, details only emerged later. Kasparov said he'd been 'a bit shocked' by the disturbance, and that it had caused him to play the inferior 24 f3. The world champion instead recommended 24 ♙c3 as a way to keep building pressure while avoiding any danger. The next day, *Scottish Chess* correspondent Jason Luchan asked arbiter Jarecki about the incident. 'When the light bulb popped, we all jumped,' she said with a laugh. 'We all thought somebody was gonna start

shooting.’

Another idea, which looks safer than the game continuation, would have been 24 ♖xg4 ♙xe3.

24 ... ♖xe3  
25 ♖xe3

White’s plan is to play ♔h1 and ♜f5. Therefore, Deep Blue cleverly transfers its bishop to g5 to pin White’s knight from another angle.

25 ... ♙e7  
26 ♔h1 ♙g5  
27 ♙e2

If White were permitted to continue undisturbed he would now follow with ♖e1 and ♜f5, securing total strategic domination. To forestall this, Deep Blue hits out with a series of tactical hammerblows.

27 ... a4  
28 b4 f5

To forestall White’s strategic occupation of f5 with the knight Deep Blue launches a savage counterattack which actually wins material.

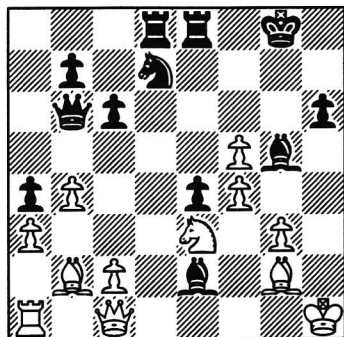
29 exf5 e4

White now has no choice but to jettison material. In compensation, though, Black’s kingside has been decimated and shorn of its pawn protection.

30 f4 ♙xe2

The main alternative is 30...♙xf4 31 gxf4 and only now 31...♙xe2. Here Kasparov gave

32 ♖g1 ♔h7 33 ♙e1 ♙h5 34 ♖h2 ♙f7 35 ♜g4 h5 36 ♖h4 with a decisive attack. Surprisingly, though, there is an even faster win after 31...♙xe2 with the simple 32 ♖d2, threatening both ♖xe2 and devastation on the long dark diagonal with ♖c3.



31 fxg5 ♜e5

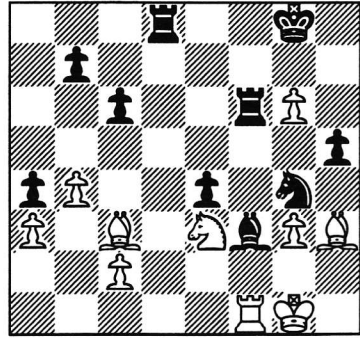
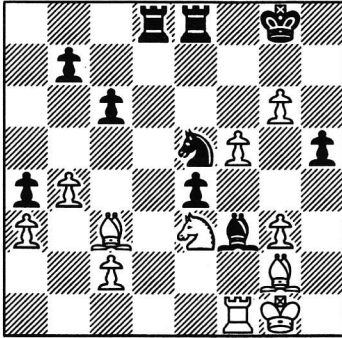
And not 31...hxg5 on account of 32 ♜c4 ♙xc4 33 ♖xg5+ winning. Now, though, White is able to preserve his phalanx of kingside pawns, entrenched deep in the heart of enemy territory.

32 g6 ♙f3  
33 ♙c3

It is important to defend the d2 square from future invasion by Black’s rooks. Still, in spite of White’s imposing pawn mass, Black itself has a passed pawn, an extra exchange and a powerful outpost square on f3. The situation does not look entirely clear, but Kasparov extracts the maximum from his chances.

33 ... ♖b5  
 34 ♗f1 ♗xf1+  
 35 ♙xf1 h5  
 36 ♕g1

♘xf6 40 ♙xf6 ♙f8 41 g4 ♙exf6  
 42 ♙xf6 ♙xf6 43 gxh5 ♙f3 and  
 Black will win) and now  
 38...♙xf6!!



36 ... ♕f8

This move is a counsel of despair. If Black wishes to challenge White's hegemony, it must strike at White's blockading knight on e3, the cornerstone of his position. Hence, the best chance is 36...♕g4. If now 37 ♙e1 ♕xe3 38 ♙xe3 ♙xg2 39 ♕xg2 ♙d5 40 f6 ♙e6 and with Black's rooks coming around behind them, White's pawn are neutralised. Therefore, after 36...♕g4 White must play more radically, but it appears that Black can still hold the balance with some quite fantastic variations: 37 f6! and now not 37...♕xe3 38 f7+ ♕f8 39 ♙xf3!! ♕xf1 40 ♙xh5 when Black is sensationally helpless against the threat of g7+, but 37...♙e6 38 ♙h3 (not 38 ♙xf3 exf3 39 ♙xf3

and Black holds on, e.g. 39 ♙xg4 ♙xg6 40 ♙h3 ♙xg3+ 41 ♕h2 ♙g5 42 ♙f2 ♙d6 and the situation is far from clear, or 39 ♕xg4 hxg4 40 ♙xf6 ♙d6 41 ♙e5 ♙e6 and White has only a very small advantage.

37 ♙h3

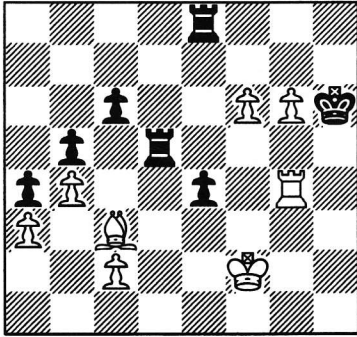
Kasparov swiftly precludes the threat of ...♕g4. Now there is no sensible antidote to the advance of White's pawns.

37 ... b5  
 38 ♕f2 ♕g7  
 39 g4 ♕h6  
 40 ♙g1

The most brutal way of enforcing a mass coronation. Black is now helpless in the face of the advance of the white pawns.

40 ... hxg4  
 41 ♙xg4 ♙xg4  
 42 ♕xg4+ ♕xg4+

43 ♖xg4 ♖d5  
44 f6



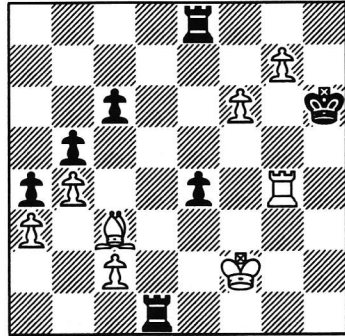
44 ... ♖d1

According to an account by Kasparov's computer adviser Frederic Freidel on the Club Kasparov website, the world champion was surprised by Deep Blue's inferior choice of 44...♖d1. 'How can a computer commit suicide like that?' Kasparov asked Freidel.

After the superior 44...♖f5+, Kasparov gives 45 ♖e3! ♖f3+ 46 ♖e2 ♖xc3 47 f7 as winning for White. After 47...♖d8, White has 48 g7 ♖xc2+ 49 ♖e1 ♖c1+ 50 ♖f2 ♖c2+ 51 ♖g3 ♖c3+ 52 ♖h4

♖c1 (not 52 ..♖d1 53 g8♘+ ♖h7 54 ♘f6+ mating) 53 g8♗ ♖h1+ 54 ♖g3 ♖g1+ 55 ♖f4 ♖f1+ 56 ♖e5 ♖d5+ 57 ♖e6. Like so many chessplayers after important wins, Kasparov and his team were riding high and deriving a great deal of pleasure from looking at these variations. Indeed, Garry then played 50...e3+ (instead of 50...♖c2+) and demonstrated 51 ♖g2 e2 52 g8♗ ♖xg8 53 fxg8♗ ♖g1+ 54 ♖f3 ♖xg4 55 ♗h8+ ♖g6 56 ♗e8+ ♖f5 57 ♗f7+ ♖e5 58 ♖xg4 and everyone burst out laughing.

45 g7 1-0



### Score

	1
Kasparov	1
Deep Blue	0





□ Deep Blue ■ Kasparov  
Sunday, 4 May  
Ruy Lopez

### Tangled Up In Blue

*'This is a game that any human grandmaster would be proud to have played for White. This was not a computer-type game. This was real chess.'*

- Joel Benjamin

From the vantage point of 4 May 1997, Robert Byrne's 1989 newspaper column describing Deep Blue's predecessor Deep Thought as playing 'like a transistorised Anatoly Karpov', could hardly have been more prescient. In a game that truly stunned – or just plain terrified – many chess observers, Deep Blue ground down world champion Garry Kasparov positionally. The computer didn't just squelch Kasparov's counterplay for almost an entire game. The world's most notorious counterattacking player was even reduced at one point to repeating moves with his bishop, marking time to and fro, waiting for the axe to fall.

The rot set in early for Kasparov with a disastrous choice of opening, a closed Ruy Lopez formation where Black had less space and a static pawn structure with no pawn breaks to free his position. After several hours of brilliant positional manoeuvring from Deep Blue, and a tortuous afternoon of grovelling from Kasparov, the world champion seemed only too eager to end his humiliation and resign the game.

It wasn't just that the computer had beaten Kasparov for the sec-

ond time in its brief career. What made this battle so extraordinary was the squashing anaconda-like style of Deep Blue's play. And the deeply prophylactic nature of some of its moves, particularly 37 ♙e4, led match commentators to conclude that it was hard, just from looking at the moves, to tell which player was the human and which player was the computer. Indeed, Patrick Wolff said that if he didn't know better, he would guess White was Karpov and Black was Zarkov (a microcomputer chess program).

Speaking to the audience after the game, F.H. Hsu credited the massive reworking of Deep Blue over the last year and cited Benjamin's efforts to improve the computer's judgement. 'This year it had a better understanding of chess and some of the subtleties of chess, and that showed up in this game,' said Hsu.

'I feel great' said a jubilant Benjamin. 'This is what I've been working toward for eight months, and the gratifying thing about it is that this is a game that any human grandmaster would be proud to have played for White. This was not a computer-type game. This was real chess.'

As the post-game briefing wound down, an audience member shouted out what was on everyone's lips: 'I have a question for C.J. (Tan). Yesterday the computer played a few dubious moves. Today it played like an absolute genius. What did you guys do to it last night?' 'We let it have a couple of cocktails,' replied Tan as the audience roared.

Meanwhile, the Internet was buzzing...

*Game 2*  
**Deep Blue-Kasparov**  
 Ruy Lopez

- |   |            |           |
|---|------------|-----------|
| 1 | <b>e4</b>  | <b>e5</b> |
| 2 | ♘f3        | ♘c6       |
| 3 | ♙b5        | <b>a6</b> |
| 4 | ♙a4        | ♘f6       |
| 5 | <b>0-0</b> | ♙e7       |

This may not be the right approach against Deep Blue. True, the Closed Defence to the Ruy Lopez, which Kasparov adopts

in this game, leads to a blocked situation, in which computers do not normally excel. However, the published theory on this line is so extensive, and Deep Blue has been so well programmed with information, that it can traverse the opening phase by rote, as it were, simply following the precedent of former grandmaster examples and maintaining a slight edge without endangering its prospects by an ill-

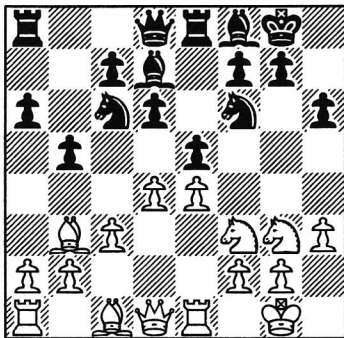
66 *Man versus Machine: Kasparov versus Deep Blue*

considered or infelicitous strategic blunder.

- |   |     |     |
|---|-----|-----|
| 6 | ♖e1 | b5  |
| 7 | ♗b3 | d6  |
| 8 | c3  | 0-0 |
| 9 | h3  | h6  |

The Smyslov System, where Black delays 9...♖a5 and 10...c5 and retains his options to keep the centre semi-open.

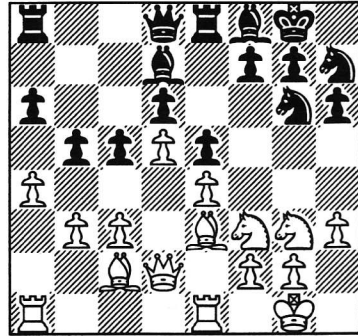
- |    |      |     |
|----|------|-----|
| 10 | d4   | ♗e8 |
| 11 | ♗bd2 | ♗f8 |
| 12 | ♗f1  | ♗d7 |
| 13 | ♗g3  |     |



Perhaps Kasparov expected his opening would lead Deep Blue to lash out, as in game one, with a weakening advance like g2-g4. However, in the further course of play, White dominates space and dictates momentum on both the king's flank and the queen's flank.

- |    |     |     |
|----|-----|-----|
| 13 | ... | ♖a5 |
| 14 | ♗c2 | c5  |
| 15 | b3  | ♗c6 |
| 16 | d5  | ♗e7 |

- |    |     |     |
|----|-----|-----|
| 17 | ♗e3 | ♗g6 |
| 18 | ♗d2 | ♗h7 |
| 19 | a4  |     |



White opens a front on the a-file and penetration of Black's camp via this avenue will form a major theme of subsequent play. Deep Blue had only used one minute on its clock up to this point.

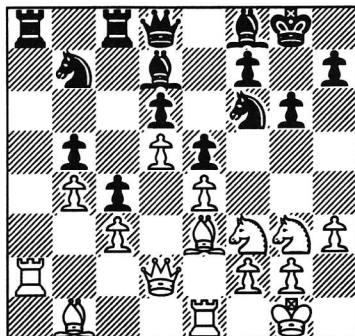
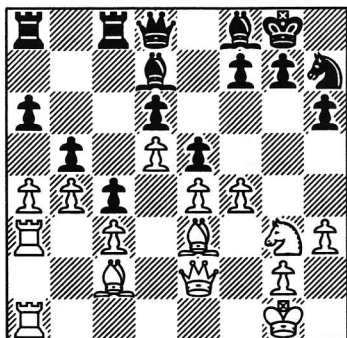
- |    |      |      |
|----|------|------|
| 19 | ...  | ♗h4  |
| 20 | ♗xh4 | ♗xh4 |
| 21 | ♗e2  | ♗d8  |

Black may have wanted to keep the queen on h4 and attack with ...g7-g6 and ...f7-f5-f4 but White's mounting queenside pressure quickly forces a change in plans.

- |    |      |      |
|----|------|------|
| 22 | b4   | ♗c7  |
| 23 | ♗ec1 | c4?! |

Blocking up the position, and leaving Black limited in terms of effective pawn breaks. Kasparov could have tried 23...cxb4 24 cxb4 ♗b7 and transferred a rook to the c-file.

24 ♖a3 ♜ec8  
 25 ♖ca1 ♜d8  
 26 f4



Word later reached some journalists that Anatoly Karpov considered this break premature. He said he preferred trying to liberate the f8 bishop with 26...exf4, because ceding the d4 square isn't such a tremendous concession with only one pair of knights on the board. Karpov thought White's best plan was to take on b5, play ♖a7 and triple on the a-file. His famous 1974 game with White against Unzicker certainly demonstrates his expertise in the variation.

1 e4 e5 2 ♟f3 ♟c6 3 ♟b5 a6 4 ♟a4 ♟f6 5 0-0 ♟e7 6 ♜e1 b5 7 ♟b3 d6 8 c3 0-0 9 h3 ♟a5 10 ♟c2 c5 11 d4 ♜c7 12 ♟bd2 ♟c6 13 d5 ♟d8 14 a4 ♜b8 15 axb5 axb5 16 b4 ♟b7 17 ♟f1 ♟d7 18 ♟e3 ♜a8 19 ♜d2 ♜fc8 20 ♟d3 g6 21 ♟g3 ♟f8 22 ♜a2 c4 23 ♟b1 ♜d8

24 ♟a7 ♟e8 25 ♟c2 ♟c7 26 ♜ea1 ♜e7 27 ♟b1 ♟e8 28 ♟e2 ♟d8 29 ♟h2 ♟g7 30 f4 f6 31 f5 g5 32 ♟c2 ♟f7 33 ♟g3 ♟b7 34 ♟d1 h6 35 ♟h5 ♜e8 36 ♜d1 ♟d8 37 ♜a3 ♟f8 38 ♜a2 ♟g8 39 ♟g4 ♟f8 40 ♟e3 ♟g8 41 ♟xf7+ ♟xf7 42 ♜h5 ♟d8 43 ♜g6 ♟f8 44 ♟h5 1-0 Karpov-Unzicker, Nice Olympiad 1974.

In another famous Closed Ruy Lopez win for White, Bobby Fischer tripled his major pieces on the a-file and crushed Boris Spassky in game one of their 1992 match.

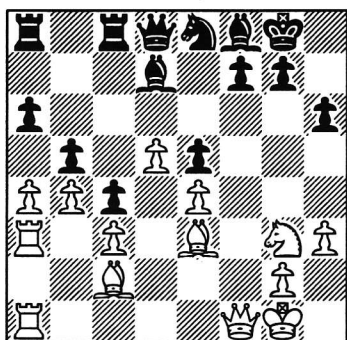
Many grandmasters would have adopted the plan of tripling on the a-file, perhaps because the human mind appreciates the 'artiness' of the manoeuvre. The computer, however, has no ego and just wants to maximise the activity of its pieces.

Many observers, however, considered White's move a well-timed advance. Either Black

must capture on f4 and expose his own d6-pawn, or allow White to take on e5, when White's d-pawn will become passed.

26 ... ♖f6  
 27 fxe5 dxe5  
 28 ♜f1 ♘e8

Black's best bet here is a break for freedom with 28...a5, e.g. 29 axb5 axb4 30 ♖xa8 ♖xa8 31 ♖xa8 ♜xa8 32 ♜xc4 ♜a1+ 33 ♔h2 ♜xc3 34 ♜xc3 bxc3 35 ♙a4 and Black has chances to hold.



29 ♜f2

Preparing ♙b6 and deterring any Black breakouts with ...a5.

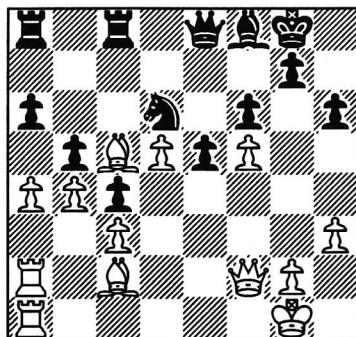
29 ... ♘d6  
 30 ♙b6 ♜e8  
 31 ♖3a2 ♙e7  
 32 ♙c5 ♙f8

Given his proclivity for active defence, this Unzicker-like waiting sequence must have been humiliating for Kasparov.

33 ♘f5

Further restricting Black.

33 ... ♙xf5  
 34 exf5 f6

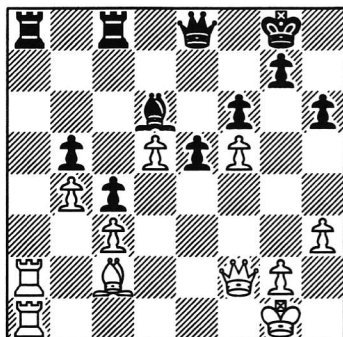


Karpov recommended 34...e4, sacrificing a pawn for play on the dark squares.

35 ♙xd6 ♙xd6

We are approaching the position which, as subsequent statements by Kasparov prove, caused the champion so much anguish. Here, he was confidently expecting the seemingly crushing 36 ♜b6, but the computer played quite otherwise.

36 axb5 axb5



37 ♖e4

A startling and seemingly profound prophylactic move from Deep Blue that would change the course of the match. Most observers had been expecting the direct, computer-like 37 ♖b6, preparing to answer 37...♙c7 with 38 ♖e6+ ♖xe6 39 dxe6! followed by a timely ♖e4-c6. At the time, this looked crushing, but Black would retain chances with a timely ...e5-e4 and ...♙e5.

37 ... ♖xa2

38 ♖xa2 ♖d7

39 ♖a7 ♖c7

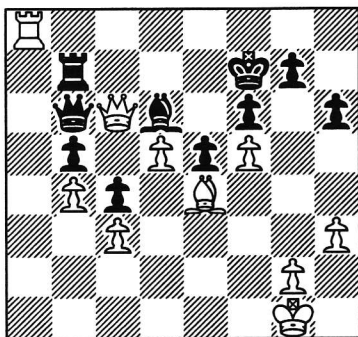
After 39...♖xa7 40 ♖xa7 ♖b8 41 ♖a6 ♙f8 42 ♙f2 Black is completely tied up.

40 ♖b6 ♖b7

41 ♖a8+ ♙f7

42 ♖a6 ♖c7

43 ♖c6 ♖b6+

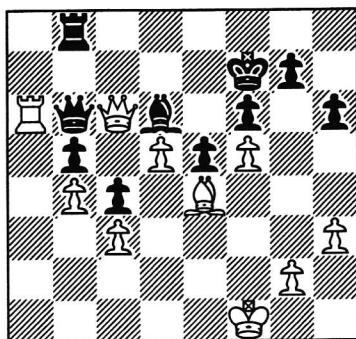


Now the incredible happens and the computer misses a clear win. The fact that Deep Blue had played so magnificently (even

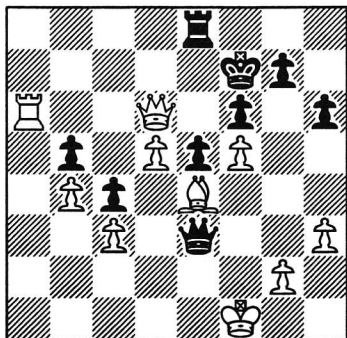
given its cautious 37th move) and yet so ineptly on move 44, appears to have unsettled Kasparov right to the end of the match. Here the simple 44 ♙h1! banishes checks and wins immediately. Instead, Deep Blue chose the unbelievable...

44 ♙f1?? ♖b8

45 ♖a6 1-0

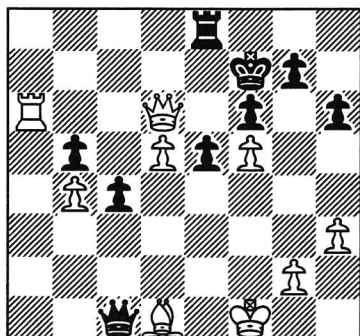


Depressed to the point of despair by the boa constrictor grip of the machine, Kasparov chose this moment to capitulate. However it is mathematically certain that at this point he missed a draw with 45...♖e3 46 ♖xd6 ♖e8!! (the star saving move) 47 ♙f3 ♖c1+ 48 ♙f2 ♖d2+ and however White plays Black will ultimately gain a draw by perpetual check with his queen. The position would be analysed furiously over the next days, and by the opening of game three, Seirawan was ready to demonstrate the variations to a riveted crowd.



After 47  $\text{f3}$   $\text{c1+}$  48  $\text{f2}$   $\text{d2+}$  49  $\text{e2}$   $\text{f4+}$  50  $\text{e1}$   $\text{c1+}$  51  $\text{d1}$ . At this point Yasser teased the audience by showing 51...  $\text{e3+}$  52  $\text{f1}$   $\text{f4+}$  53  $\text{g1}$   $\text{e3+}$  54  $\text{h1}$  and White wins after 54...  $\text{e1+}$  55  $\text{h2}$   $\text{xd1}$  56  $\text{a7+}$   $\text{g8}$  57  $\text{d7}$ .

But instead of 51...  $\text{e3+}$ , Black's drawing resource is 51  $\text{xc3+!}$  52  $\text{f1}$  (answering 52...  $\text{d3+}$  with 53  $\text{e2}$ ) and now the quiet, but brilliant 52...  $\text{c1!!}$

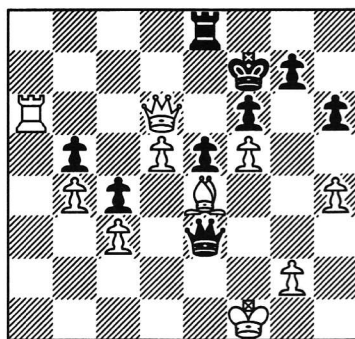


'A computer saw it, I didn't

see it, I confess,' Seirawan said, referring to the Fritz program.

And if 53  $\text{a7+}$   $\text{g8}$  54  $\text{d7}$  Black has 54...  $\text{xd1+}$  55  $\text{f2}$   $\text{d2+}$  56  $\text{g1}$  (of course 56  $\text{g3}$  allows  $\text{f4}$  mate) 56...  $\text{c1+}$  and White can't escape from the box closed around its King.

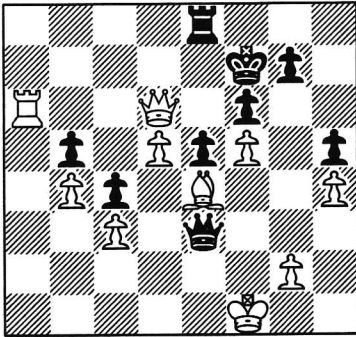
A better try for White after 45...  $\text{e3}$  46  $\text{xd6}$   $\text{e8}$  is 47  $\text{h4!}$  creating an extra escape square for the king.



If Black now tries 47...  $\text{xe4}$  48  $\text{a7+}$   $\text{g8}$  49  $\text{d7}$   $\text{f4+}$  White can wriggle out of the perpetual 50  $\text{g1}$   $\text{c1+}$  51  $\text{h2}$   $\text{f4+}$  52  $\text{h3}$   $\text{e3+}$  53  $\text{g3}$ . The natural 47...  $\text{e7}$  also loses after 48  $\text{f3}$   $\text{c1+}$  49  $\text{f2}$   $\text{d2+}$  50  $\text{g3}$   $\text{e1+}$  51  $\text{g4}$   $\text{h5+}$  52  $\text{hxh5}$   $\text{g3}$  and now White has the remarkable 53  $\text{e6+!!}$   $\text{xe6}$  54  $\text{dxe6+}$   $\text{g8}$  (or 54...  $\text{e8}$  55  $\text{a8+}$   $\text{e7}$  56  $\text{a7+}$   $\text{e8}$  57  $\text{e6+}$   $\text{f8}$  58  $\text{e7+}$   $\text{g8}$  59  $\text{e8}$   $\text{g+}$   $\text{h7}$  60  $\text{g6+}$   $\text{xg6}$  61  $\text{fxg6+}$   $\text{g8}$  62

♖a8 mate) 55 ♖a8+ ♔h7 56 ♖h8+ ♔xh8 57 e7 and wins.

But after 47 h4!, Black has the amazing resource 47...h5!! which builds a new fortress by blocking off the h3-g4 escape route.



And after 48 ♗f3 ♖c1+ 49 ♔f2 ♖d2+ 50 ♔g3 ♖f4+ 51 ♔h3 ♖xf5+ 52 ♔h2 ♖f4+ Black draws.

An analysis published the next day on the Smartchess website run by Karpov second GM Ron Henley, examined 47...♖xe4 (instead of 47...h5!!) for Black. After 48 ♖a7+ ♔g8 49 ♖d7 ♖f4+

50 ♔g1 ♖c1+ 51 ♔h2 ♖f4+ 52 ♔h3 and now 52...♖e7!! 53 ♖c8+ ♔h7 54 ♖xe7 (54 ♖a8 ♖e8! is a pleasing echo of Black 52nd move) and now 52...h5!! once again closing the perpetual check net around the white King. And White has no good way to avoid the draw.

It should also be noted that if White tries to go around all this and gain a tempo with 46 ♖d7+ ♔g8 and now 47 ♖xd6 Black has 47...♖f8!. A final winning try for White, suggested by Roman Dzindzihashvili, is to simply return the piece with 45...♖e3 46 ♖xd6 ♖e8 with 47 ♖c5, but Black seems to be doing fine: 47...♖xe4 48 ♔g1 ♖e1+ 49 ♔h2 ♖c1 or 48 ♖a1 ♖d3+ 49 ♔g1 ♖xc3 50 ♖a8+ ♔g8 51 ♖c7 ♖c1+ and Black makes it out alive. Of course, none of these perpetuals would be available if Deep Blue had found 44 ♔h1 instead of 44 ♔f1, or simply traded queens.

### Score

	1	2	
Kasparov	1	0	1
Deep Blue	0	1	1



# 3

## □ Kasparov ■ Deep Blue Tuesday, 6 May English Opening

### Torturing the Toaster

*'We humans get depressed.'*

– Yasser Seirawan

Despite Kasparov's intelligent, humorous choice of 1 d3 to take Deep Blue out of its book, much of the attention during the first two to three hours of game 3 focused on the astonishing news that the world champion had actually resigned game 2 in a position where he could force a draw by perpetual check. For this reason, the commentary team began switching back and forth between today's game and trying to explain the rationale behind Kasparov's resignation. Eventually, Seirawan found time to reel off a whole series of convincing variations from game 2 suggesting that Kasparov did indeed resign in a drawn position. 'He knew he had a lost position. He convinced himself he had a lost position – so he resigned,' said Seirawan. 'We humans get depressed.'

Back in real time, Kasparov appeared to be building up a nice edge with quiet, creeping ultra-positional play. But Deep Blue grabbed a sacrificed pawn, traded queens and retreated into a defensive huddle that was brutally hard to crack apart.

'He (Kasparov) may not win but he can torture Black – just think how you'd feel if you were Black?' asked Valvo rhetorically. Picking up the bait, Ashley began comparing the notion to torturing his

stove or refrigerator. ‘Pinch it and tickle it but it doesn’t care,’ Ashley said to laughter in the audience. ‘Deep Blue is saying – “we can do seven hours of this, baby, I’m never going to get tired.”’

At this moment an audience member suggested an aggressive winning try for Garry. Instead of the trade 41 ♖xc7, which gave up the ghost of victory and led the game inexorably to a dead draw, what about 41 ♖e7? But later analysis showed this wasn’t good enough either. Indeed, try as they might, the grandmaster analysts couldn’t find any real moment in the game when Kasparov could have broken down the Deep Blue fortress.

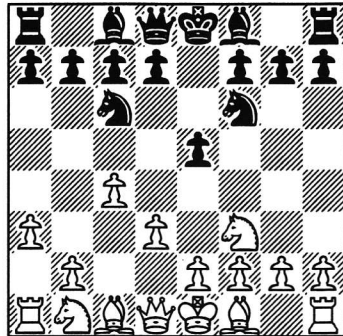
As Kasparov stepped into the elevator en route to the auditorium, it was time to take stock of what Deep Blue had already accomplished. The computer was tied 1½-1½ in the contest, it had stopped Garry from playing his favourite Sicilian Defence, it had led him to resign in a winning position, and it had even got the world champion to open with 1 d3.

*Game 3*  
**Kasparov-Deep Blue**  
English Opening

1 d3

Deep Blue’s strengths are traditionally in the area of tactics and calculation. It is also clear that in the past year its minders have added an extra dimension of profound theoretical knowledge. Kasparov’s first move in this game is, therefore, a sensible choice. It is a flexible opening move, with many transpositional possibilities and little or no concrete opening theory attached to it.

1	...	e5
2	♖f3	♖c6
3	c4	♖f6
4	a3	



A move in the same vein as White’s first.

4	...	d6
5	♖c3	♗e7

Most grandmasters would automatically choose 5...g6 and ...♗g7 here. Left to its own devices, Deep Blue would probably not fianchetto in this fashion, since it places a higher priority

on developing a piece than placing it on a better long range square. 5...♗e7 develops the bishop in one move whilst 5...g6 expends two.

6 g3

A kingside fianchetto, much as in game one. The long range plan is, in conjunction with the advance b2-b4, to strike at Black's queenside light squares.

6 ... 0-0  
7 ♗g2 ♗e6  
8 0-0 ♖d7

Black's opening is somewhat unsophisticated, though not necessarily bad. The intention appears to be to play ...♗h3 and trade off White's powerful bishop.

9 ♖g5

According to Freidel's daily website report, Garry was disappointed with this knight manoeuvre after the game. 'If I had played 9 b4 instead of 9 ♖g5 I would have crushed it', he was reported to have said. Kasparov reeled off variations such as 9 b4 e4 10 dxe4 ♗xc4 11 ♖d2 ♗e6 12 ♖d5 a5 13 b5 ♖e5 14 a4 ♖xd5 15 exd5 ♗f5 16 ♗d2 ♗f6 17 ♗b3 and White is better.

9 ... ♗f5  
10 e4

The point of White's previous move, but now Kasparov makes the central pawn structure rigid and gives Black an outpost on d4

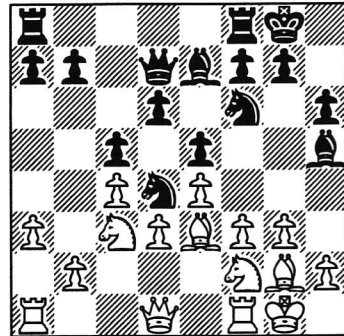
for a knight, one that can no longer be challenged by a white pawn.

10 ... ♗g4  
11 f3 ♗h5  
12 ♖h3

In this position 12 ♖e2 deserves serious consideration to meet ...♖d4 with ♖xd4. Since White's knight on g5 was not threatened there was no urgency to retreat it.

12 ... ♖d4  
13 ♖f2 h6  
14 ♗e3 c5

Black is well entrenched in the centre but at the slight cost of his queen's bishop being driven somewhat offside.



15 b4

Kasparov goes for play on the queen's wing, probably fearful that Black might start operations there itself with ...a7-a6 and ...b7-b5.

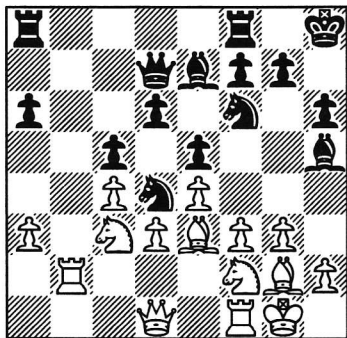
15 ... b6  
16 ♖b1 ♗h8

A mysterious king move, which Deep Blue seems to be quite fond of playing. It also cropped up in game one and, as we shall see, in game four. Is it too much to speculate that Deep Blue was already trying to work out a rescue route to revive its quasi-stranded queen's bishop via the manoeuvre ...♔g6-h7-g8 and ultimately the pawn advance ...f7-f6 to allow the bishop out?

17 ♖b2 a6

Renewing the threat of ...b7-b5, so Kasparov feels constrained to trade first.

18 bxc5 bxc5



The open b-file, if anything, favours Black because of its strong knight on d4. White cannot play ♔xd4, since this would leave his dark squares too exposed.

19 ♔h3

Offering a deep pawn sacrifice. Of course, after 19...♗xf3+ 20 ♔h1 White threatens both

♔xd7 and g3-g4 severing the lifelines of Black's knight. If 19...♗xf3+ 20 ♔h1 and now 20...♗d4 21 ♖xh5 ♗xh5 22 ♔xd7 wins a piece. More testing is 19...♔xf3 though then 20 ♔xd7 ♔xd1 21 ♖fxd1 ♗xd7 22 ♖b7 gives White positional compensation for his lost pawn.

19 ... ♖c7

20 ♔g4

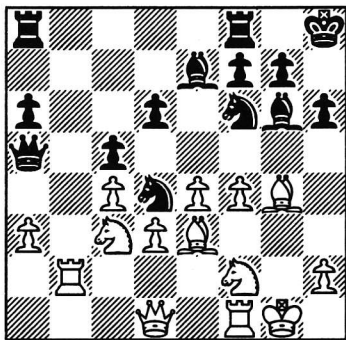
A good move, indeed the only way to make progress since 20 g4 ♔g6 would leave White's pawn structure looking like a Swiss cheese. If now 20...♗xg4 21 fxg4 or 20...♔xg4 21 ♗xg4 White swiftly gains control of d5 with his knight, whilst retaining the possibility of eliminating Black's centrally placed knight by means of ♔xd4. In that case, White would have a clear advantage. His unassailable knight on d5 would dominate the board, whilst the slight weakness of his own dark squares would be minor in comparison.

20 ... ♔g6

The correct response. Although the bishop runs the danger of facing a white pawn roller, Deep Blue keeps control of d5 and prepares to counterattack on the queenside. White's next move is strategically consistent, but tactically premature.

21 f4 exf4

22 gxf4 ♖a5



White is now forced to sacrifice a pawn, in as much as the only move to save material, the retreat 23  $\text{♖b1}$ , is patently too passive.

23  $\text{♙d2}$   $\text{♜xa3}$

Deep Blue succumbs to computer greed. Here 23... $\text{♜xg4}$  might have exposed the white position as overextended. Hardly surprising, given that White has already advanced in the centre, the queen's flank and on the kingside, and does not have any real compensation for Black's strong knight on d4.

24  $\text{♜a2}$

In the press room everyone was expecting 24  $\text{♜b7}$  but 24... $\text{♙d8}$  seems okay for Black.

24 ...  $\text{♜b3}$

25  $\text{f5}$   $\text{♜xd1}$

26  $\text{♙xd1}$   $\text{♙h7}$

Black's queen's bishop has been virtually buried alive but the extra pawn is a useful asset. In spite of the various complica-

tions and material transactions, the basic equilibrium of the position has not been seriously disturbed.

27  $\text{♞h3}$

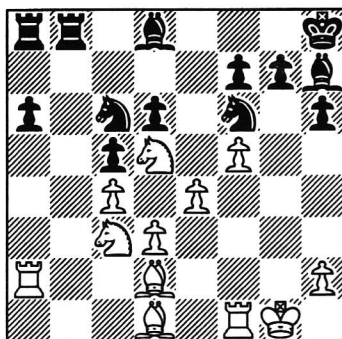
To underscore his grip over d5.

27 ...  $\text{♜fb8}$

28  $\text{♞f4}$   $\text{♙d8}$

29  $\text{♞fd5}$   $\text{♞c6}$

The knight drops back to shield the weak d-pawn.



30  $\text{♙f4}$   $\text{♞e5}$

31  $\text{♙a4}$

On this square the bishop blockades Black's queenside and also strikes into Black's camp via the light squares.

31 ...  $\text{♞xd5}$

32  $\text{♞xd5}$   $\text{a5}$

Here, and on subsequent moves, it would be unwise to play ... $\text{♞xd3}$  on account of  $\text{♙xd6}$  when Black's rooks are in a tangle.

33  $\text{♙b5}$   $\text{♜a7}$

34  $\text{♞g2}$   $\text{g5}$

35 ♖xe5+ dxe5

36 f6

Forestalling the liberating manoeuvre ...f7-f6 followed by ...♗g8, but now Black's bishop gains space on the kingside.

36 ... ♗g6

37 h4

There was a danger that Black might play ...h7-h5. With this move White gives up another pawn but can easily regain it.

37 ... gxf4

38 ♖h3 ♖g8

39 ♖xh4 ♖h7

40 ♖g4 ♗c7

The last difficult move of the game. By giving back the extra pawn Black relieves its cramp and counter-exposes White's pawn on d3 as a serious weakness. After this there is nothing that White can achieve. If Black were to cling stubbornly to the extra pawn White has the long term plan of doubling rooks on the h-file and meeting the defence ...h5 with a swift ♗a4-d1, when Black might find itself in a mating net. If White now tries to keep up the pressure with 41 ♗e7, then 41...♗f8 is sufficient defence.

41 ♗xc7

Kasparov smiled to himself briefly as he swiped the bishop, knowing that by now the game would end in a draw. An audience member suggested 41 ♗e7 as a better winning try. It is tricky for Black. 41...♗bb7 loses to 42 ♗c8! ♗a8 43 ♗c6 but after 41...♗ab7 42 ♗h2 h5+ 43 ♖g5 ♗d6! White doesn't seem to have a viable way to break through as he needs the bishop on b5 to plug the b-file.

41 ... ♗xc7

42 ♗xa5 ♗d8

43 ♗f3 ♖h8

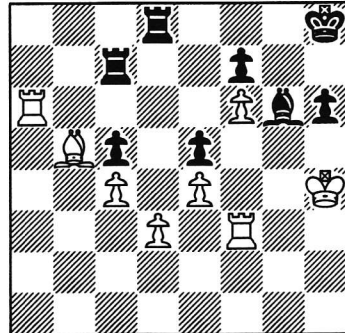
44 ♖h4 ♖g8

45 ♗a3 ♖h8

46 ♗a6 ♖h7

47 ♗a3 ♖h8

48 ♗a6 ½-½



Score

	1	2	3	
Kasparov	1	0	½	1½
Deep Blue	0	1	½	1½

# How Do We Tell Garry?

*'It's very easy to fool yourself in areas you want to be fooled in.'*  
- Woody Allen

Some heard by phone. Some heard by fax. Some tried to analyse it out with their friends. Others discussed it on the Internet. Co-author Goodman found out in a late-night call from IM Elliott Winslow, who was online at home in San Francisco the very moment the move was discovered. Jason Luchan, covering the match for *Scottish Chess*, knew for sure when he bumped into Joel Benjamin at lunchtime on Monday. 'It is draw,' confirmed Benjamin in a jokey, but passable Russian accent.

As game three began on Tuesday, both Seirawan, down in the auditorium, and Benjamin, up in the press room, were talking about a kind of 'mass hypnosis' among the chess elite. It seems a psychologically crushed Kasparov had simply trusted the computer's analysis of the tactics in the position, and just about everyone else had trusted Garry. Several observers also noted that Kasparov, who wins 58 percent of his games with the white pieces, has little experience in going for a weekend swiss player's 'cheap perpetual'.

When the 5.00pm news conference in the press room began to wind down, Gregory Belmont, of the Internet Chess Club, stole a little of IBM's thunder when he told reporters the drawing line had first been suggested on his service. Belmont said the key move 46...♖e8!! was first posted by Michigan philosophy professor Tim

McGrew during an exchange with IM Dusko Pavasovic. Moreover, he said, McGrew had keyed in the move moments before Kasparov resigned. An observer then suggested that in contrast to Deep Blue's use of massive parallel processing, this was a dramatic example of massive biological processing – dozens of people connecting and communicating to draw the best out of each other.

Back in the auditorium, the match commentators were still wrestling with the implications of the loss. Maurice Ashley said it backed up the feelings of many players that nothing is to be gained from resigning. 'What would this mean historically if you had a reigning world champion resign (this) position in a multi-million-dollar match?' said one of the commentators. 'I mean, I can hear Oliver Stone say, "What's the conspiracy here?"'

Seirawan suggested that Kasparov might feel a very strong sense of self-loathing on understanding what he had done 'The computer has an advantage. It doesn't have this body of emotions. We human players get depressed. We simply get depressed. The computer doesn't get depressed, it doesn't have any prejudice, it doesn't carry along any emotional turmoil or upset... Garry was feeling rotten the whole game because Garry was getting outplayed the whole game. Garry was in a mental framework which said to himself "Man, I hate this game. I'm disgusted with myself. I played like a jerk. I'm going to lose in front of millions of fans. What am I doing here? Why did I wake up today?"' said Seirawan. 'Again, there is that intimidating factor. When you sit there and you're told that your opponent analyses chess at 200 million moves a second, and all you're looking at is a three or four move perpetual check, you've got to figure that your opponent's seen everything.'

As game three moved toward its climax, Kasparov adviser Frederic Freidel came out on the stage. Freidel said his Fritz program had found the draw at 2.00 in the morning. 'And then came the question – How do we tell Garry about it?'

*Ashley:* Did you consider not telling Garry?

*Freidel:* Yes, we considered briefly not telling Garry, but then we realised the first taxi driver is going to say it. (Audience laughter.) So that option was out. And then the two options were: do we tell him before lunch, or do we spoil his lunch? And we decided to tell him before lunch. We were walking down Fifth Avenue to an Italian restaurant, and Yuri (Dokhoian, Kasparov's second), because he speaks



Russian, went up to Garry and said, 'Listen, kid,' and explained it to him, and Garry stopped dead in the middle of Fifth Avenue, and he stood there in the middle of the street (Freidel puts his hands on his head to mimic Kasparov's reaction), not crossing the street, on the pavement. Then he didn't say anything. Yuri whispered to him, and we went into the restaurant, we sat down, and for five minutes he just stared at the corners of the restaurant, click, click, click - click, click, click working on variations.

'Then he looked up and nodded and said, 'So simple, just, you know, ...♠e8, h3-h4, ...h6-h5, so simple, how could it be possible?' And he told me. He was so impressed by the computer, especially this one move, ♗e4, was so awesome... It's a very positional move, that's the scary part about it and we didn't know what was going to happen because the computer wasn't supposed to be able to play positional chess, tactically better than Kasparov, but positionally it's supposed to be miserable, but (look) what happened last game.'

After some analysis of game three, the discussion continued.

*Seirawan:* I still have to go back to the restaurant. (Audience laughter.) I mean from my side, you have to understand that chess professionals are very proud persons. They are artists, they take their art very, very seriously. To play a great game is very meaningful for a player's career. To resign a drawn position is unthinkable. I mean I would just torture myself mentally. I mean how does Garry recover from something like this?

*Freidel:* I asked him, 'Has this ever happened to you before? (He) concentrated a few seconds and said no... I think (I said before) it must have been a miserable meal. It wasn't. And he's amazing. After about 10 or 15 minutes, he suddenly was fired up and started telling us about some Russian movie, it's called 'Munchausen'. It's a fairy tale but it has deeper levels at which you can understand it. He explained those deeper levels to us. He acted out some of the roles, how the actors did it, translated and so on, and we had a wonderful time. It was the best - one of the most - funniest and enjoyable meals we've had in a long time.'

It was a wonderful story told in an exceptional way by the teflon-smooth Freidel. And of course, the IBM team didn't face the same difficulties. 'It's certainly nice not to have the problem of how do you handle the news that it was a draw,' Campbell explained earlier that day. 'And you know, Garry will have to display great nerves in

order not to let such a thing bother him.' Asked if he minded scoring the full point because of a premature resignation, Campbell replied, 'You take the win however you get it.'

### Ghost in the Machine?

*'It reminds me of the famous goal which Maradona scored against England in 1986. He said it was the hand of God.'*

– Garry Kasparov, replying to the question of whether there was human intervention in this game.

After game three Kasparov and the Deep Blue team were welcomed to the auditorium with a loud ovation.

*Ashley:* Well, Garry, it's sort of the same as last year. We've got three games under the belt, one and a half to one and a half. What's your take now on this new 'Deeper Blue?' Is it deeper?

*Kasparov:* It was definitely deeper yesterday.

(Audience laughter.)

Kasparov explained that in the key game two position after a possible 46 ♖xd6 he 'couldn't make good calculations'.

*Kasparov:* 'This machine missed a – from a computer point of view – elementary draw, and I resigned a position which was probably drawn. And, you know ... I would try against any human being, but with computer, probably it saw it. Now I think we had an amazing game ... but anybody who plays chess and who knows a little bit about computers understands that game one and game three are very, very different from game two.'

Finally Kasparov said he couldn't understand the contradiction between the brilliant 37 ♙e4, which he described as a 'very human decision', and Deep Blue's failure to see the perpetual and play 44 ♖h1.

*Benjamin:* Well, Deep Blue simply plays what it thinks is the best move, and when it had the opportunity to play (36 ♖b6) in the first position, that was its original intention, but the longer it looked at it, the less happy it was with it, if I may use a human term, and it saw that Black would sacrifice two pawns and gain compensation, and it understands compensation because that's part of its evaluation, and it just evaluated the position after 36 ♖b6 as not being its best possibility. So it played 36 axb5, and then after that it also considered 37 ♖b6 again, but it saw that there was something wrong with it. So it

decided that 37 ♙e4 was the best move. That's all it did.

*Kasparov:* It's very strange that the machine suddenly got confused. It spent so long on 37 ♜b6 and I would very much like to know what was the variation. By ply 25, I didn't find anything unplayable from a computer point of view. White still had a sizeable advantage. Then at the last moment it didn't calculate a much simpler line with 45...♜e3 and all these checks. It's a much easier task for a computer than to not play 37 ♜b6.

*Ashley:* If I'm reading you correctly, Kasparov, or maybe I'm speaking out of turn. Do you think that there may have been some kind of human intervention during this game?

*Kasparov:* It reminds me of the famous goal which Maradona scored against England in 1986. He said it was the hand of God. Suddenly Deep Blue played like a god for one moment, and then it made a very bad blunder on the last move. White's position was absolutely winning, you know, just a queen exchange or rook exchange. And whatever the exchange, Black is passing away to his doom.

In response to a question from Ashley, Benjamin declared:

*Benjamin:* I think that it's definitely a mistake for Garry to give a position to Fritz or any other computer and say, 'This is computer behaviour and this is what Deep Blue must be thinking or what Deep Blue would do.' I think he's seen from the games that he's played against Deep Blue that Deep Blue is no ordinary computer, that Deep Blue plays at an entirely different level from any other computer he's seen. So maybe he should come to grips with the fact that Deep Blue can do a lot of things that he did not think were possible.

Benjamin's words seemed to visibly annoy the world champion and he replied testily:

*Kasparov:* This is not a very fair statement. I definitely understand better than anybody else the difference between Deep Blue and any other computer (Audience laughter, audience applause.) – but what's most amazing is that the same machine suddenly lost its intelligence and in a completely winning strategical winning position missed the perpetual... And let me tell you that to reject 37 ♜b6 is ten times more difficult than to find 45...♜e3.

*Valvo:* Is there any chance that we can get you two guys together after this match into a lab to discuss this position?

*Tan:* Sure, after the match we'll be glad to have Garry come up to our lab and continue our scientific experiment with him. After all,

one of the purposes of this exercise is to explore how we use the supercomputer to solve problems and I can guarantee you that this supercomputer is so much faster and can look much deeper and sharper, than any other. I think it is really flattering for Garry to say that Deep Blue plays so differently from other computers, and I think we should just wait and see how the rest of the match will go. And there will be many other surprises, I am sure.

*Kasparov:* Yes, yes. And we're talking about the purity of the experiment. One would like to, you know, have both opponents in equal conditions. One is invisible, as an opponent, and I think we'll have plenty of surprises, but again, I'm keeping my own opinion that game one and game three they are typical computer games. Game two was slightly different.'

Kasparov's 'Hand of God' comment stunned European and Latin American observers at the match, all of whom were conversant with soccer lore. In contrast, most North Americans actually mistook it as praise for the computer's remarkable abilities. Anyone who followed soccer knew he was referring to a 1986 world cup quarter-final duel between England and Argentina. In that game, Argentinean superstar Diego Maradona got away with knocking the ball with his hand into the net to score the decisive goal. Questioned about the incident after the game Maradona referred to his action as 'The Hand of God'. In the minutes after Kasparov spoke, some chess fans began to fear the contest might sink into a flurry of nasty accusations. But the story in Wednesday's *New York Times* ran under the headline 'Wary Kasparov and Deep Blue draw game 3' and began with the world champion's unusual first move, only getting to Kasparov's allegations in paragraph five. Most of the rest of the general news media stayed clear of the allegations. The story seemed to be dead, and it was, at least for a few days.



## □ Deep Blue ■ Kasparov Wednesday, 7 May Wade/Pribyl System

### The Thin Blue Line

*'How can it be very strong one day and loony the next?'*

- Robert Byrne

After the extraordinary drama of Monday and Tuesday, the action surrounding Wednesday's fourth game turned out to be less mind-boggling - at least off the board anyway. Chess fans waiting to see what offbeat opening Kasparov would come up with this time could hardly have been disappointed by his choice of the Wade/Pribyl - an opening so little known that a group of commentators in the press room spent several minutes simply discussing what to call it.

In any event, Garry's latest experiment turned out to be a brilliant choice. The world champion built up a safe, solid structure similar to the French Defence. But unlike game two, it was full of possibilities for pawn breaks to unravel his position.

After a rook swing from Deep Blue on move 15, Kasparov sank deep into thought for a surprising 37 minutes on what appeared to be a natural reply. What he was up to became apparent when Garry flicked out a 17th move queen recapture, leaving himself saddled with a set of weak doubled pawns, but with play along the f-file.

As Deep Blue regrouped in the centre, Kasparov unleashed a tremendous pawn sacrifice to free his pieces and take advantage of the holes in White's position. Deep Blue responded with a dreadful pawn

advance on the queenside. It was now the second game that in a position with both kings castled on the same side, the computer had chosen to thrust its knight's pawn forward in front of its king. 'How can it be very strong one day and loony the next?' said the venerable GM Robert Byrne.

After rejecting a direct assault against the weakened white monarch, Kasparov traded queens and moved into an extremely favourable ending. Another mysterious white rook move - which appeared to have no purpose at all - gave Kasparov time to flood White's position with his rooks.

As the crowd in the auditorium began to smell blue blood, they were roused on by the commentators. When Seirawan said 'It looks to me like Deep Blue is in deep doo-doo,' the auditorium filled with laughter. There was applause, even some cheering for Kasparov's move. And on the far left in the fifth row, one man kept chanting 'yes, yes' as Kasparov's pieces swooped into White's position.

But the world champion allowed all four knights to be traded, reaching a double rook and pawn endgame where Deep Blue had hidden counterchances. In an endgame so hideously complicated that analysts in the press room were left feeling exhausted, both sides tried to use mate threats to push their passed pawns down the board. The mantra from experts was that there might be a win in there somewhere for Black, but nobody was able to demonstrate anything concrete. After two hours of tense and tortuous manoeuvres, the world champion, too, gave up the search for a win. 'I think I was winning at one point,' said a drained, ashen-faced Kasparov, 'but I didn't manage well. I was very tired and I couldn't figure it out.'

During the game, IBM Chairman Louis Gerstner dropped in on the Deep Blue war room to congratulate his brilliant research team. 'It's great what you've done,' he said, according to the *New York Times*. 'I just think we should look at this as a chess match between the world's greatest chess player and Garry Kasparov.'

A brilliant piece of P.R., of course, even if his visit coincided with a game where Deep Blue was forced to struggle for several hours to hold the draw. When it was all over, Murray Campbell told spectators that the machine never saw a clear loss. 'Deep Blue was barely hanging on for several hours, so we were glad (to draw).' With big advantages in the last two games and a couple of days to rest, it appeared the initiative had swung back to the world champion. On the

other hand, Kasparov only had one game left with White and the score was locked at 2-2.

And his failure to put Deep Blue away was noticed just about everywhere. Friday Night's *Late Night With Conan O'Brien* contained the item 'Who's the Better Talk Show Host - Deep Blue or Conan O'Brien?' Sitting next to a chess clock and a man typing words into and receiving messages from a computer, Conan, and what he referred to as Deep Blue, set about interviewing TV star Judd Nelson. Conan's questions were far less funny and perceptive, of course, than the ones scriptwriters had prepared for their artificial interviewer.

*Game 4*  
**Deep Blue-Kasparov**  
 Wade/Pribyl System

- 1 e4 c6  
 2 d4 d6

Employing the same strategy, with reverse colours, as in game three. Here, though, Kasparov is careful and avoids prematurely fixing the central pawns.

- 3 ♘f3 ♘f6  
 4 ♘c3 ♙g4  
 5 h3 ♙h5  
 6 ♙d3 e6  
 7 ♚e2 d5  
 8 ♙g5 ♙e7  
 9 e5

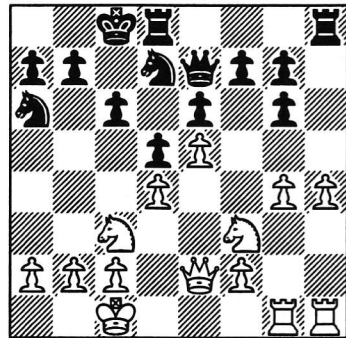
Black's next move allows his pawn structure to be damaged, even though he does gain the half open h-file in compensation. Instead 9...♙xf3 10 ♚xf3 and only now 10...♘fd7 merits serious consideration.

- 9 ... ♘fd7  
 10 ♙xe7 ♚xe7  
 11 g4 ♙g6

12 ♙xg6 hxg6

Also possible is 12...fxg6 and after 13 h4 h6 14 ♚d3 ♚f7 15 ♙h3 0-0 Black is ready to break out with ...c5.

- 13 h4 ♙a6  
 14 0-0-0 0-0-0  
 15 ♙dg1



This strange move, which appears to do very little, was widely criticised by commentators. Black can answer 15 h5 g5 16 ♚e3 with 16...f6 and the prophylactic 15 ♙de1 fails to stop anything after 15...♘c7. White's best is 15 ♚e3 (to prevent ...g5)

15...♘c7 and now 16 h5. In this case Black must hit back in the centre immediately with 16...c5 17 hxg6 fxg6 18 ♘g5 ♗df8 19 f4 cxd4 20 ♖xd4 ♗c5.

15 ... ♘c7

16 ♖b1

Another mysterious king move. When not in programmed theory Deep Blue regularly resorts to this type of manoeuvre. More dangerous for Black seems 16 h5, threatening to shatter Black's kingside pawns and meeting 16...gxf5 with 17 gxf5, exposing a weakness at g7. At least the king move avoids 16 ♘g5? ♗xh4 17 ♗xh4 ♖xg5+.

16 ... f6

Black has alternative schemes including ...♗b6 or even a queenside attack based on ...b7-b5, ...♗b6 and ...a7-a5. However, Kasparov was clearly worried about the possibility of h4-h5 by White. In order to forestall this he goes for immediate counterplay himself on the f-file, even though this exposes black weaknesses at e6 and g6.

17 exf6 ♗xf6!

Kasparov has emerged nicely unscathed from the opening. 17...gxf6 would have justified White's ♗dg1 and after 18 g5 f5 19 ♘e5 ♘xe5 20 ♖xe5 ♗d6 21 ♖xd6 ♗xd6 22 ♘e2 the knight is coming to f4 with ideas of a later h4-h5 break. Now White's rook

is left looking silly.

18 ♗g3 ♗de8

19 ♗e1 ♗hf8

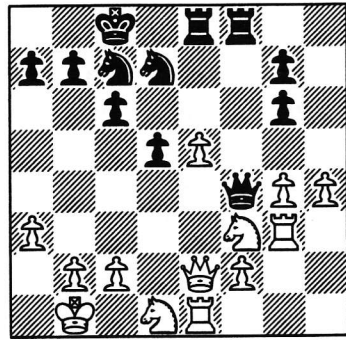
20 ♘d1

Defending the f-pawn and thus threatening ♘g5. Kasparov now sacrifices a pawn to activate his pieces and seize key squares.

20 ... e5

21 dxe5 ♗f4

22 a3



A human player would find this, and White's following play, strange. With this move, White actually prepares to play b2-b4 to chase away any black knight that reaches the c5 square. But the move is useful in creating an escape square for the king. If 22 ♗d3 White's back rank proves vulnerable after 22...♘xe5 23 ♘xe5 ♗xe5 24 ♗xe5 ♖xe5 25 ♖xg6 ♗xf2 26 ♗e3 ♗f1.

22 ... ♘e6

23 ♘c3 ♘dc5

24 b4 ♘d7

25 ♖d3 ♗f7



26 b5

The parallel to game one, in which Deep Blue wrecked its own kingside with ...g7-g5 and ...g5-g4, is clear. Here, though, White is a pawn up and there is activity all over the board, so its self-inflicted weaknesses in the king's field are tough to exploit.

26 ... ♖dc5

A possibility here is 26...♖b6 with which Black can aim to exploit White's king position with the queens on.

27 ♗e3 ♗f4

28 bxc6 bxc6

29 ♖d1 ♔c7

30 ♔a1

And not the capture 30 ♖xd5 when 30...♗xe3+ follows.

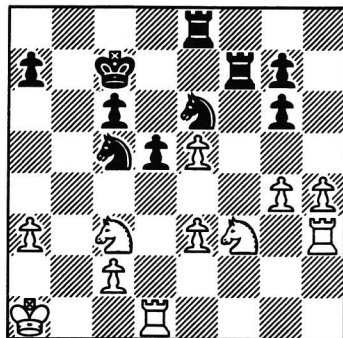
30 ... ♗xe3

Going into a favourable ending. Against a human opponent Kasparov would have been sorely tempted into 30...♗c4 (or 30...♖f7, as he later suggested) zig-zagging the queen over to harass White's open king. After 31 ♖d4 Black can drop back with 31...♗a6 32 ♖b1 and now either 32...♖e4 or 32...♖f4 look good.

31 fxe3 ♖f7

32 ♖h3

Apparently inexplicable, but the idea is probably to play h4-h5 and h5-h6, in conjunction with ♖d4, and thus eliminate all the kingside pawns.



32 ... ♖ef8

33 ♖d4 ♖f2

34 ♖b1 ♖g2

35 ♖ce2 ♖xg4?

The key moment. Kasparov snaps up the g-pawn, probably assuming that White's pawn structure is so appalling, its position is simply untenable. However, Garry's impetuous pawn grab is not as strong as 35...♖ff2. Now if White tries to alleviate the pressure with 36 ♖xe6+ ♖xe6 37 ♖d4 Black has the dangerous knight manoeuvre 37...♖c5! 38 g5 ♖e4 39 e6 ♖c3 40 ♖b3 (40 e7 allows 40...♖xc2! 41 ♖xc2 ♖xc2 42 ♖b2 ♖c1+ mat-ing) 40...♖xc2 41 ♖xc2 ♖xc2 42 ♖xc3 ♖xc3 and Black is doing rather well. After 43 ♖f3 ♖d6 44 ♖b2 d4 45 ♖f7 ♖xe3 46 ♖d7+ ♖c5 47 e7 ♖c4 the Black c- and d-pawns will be hard to stop, particularly combined with threats against the king.

36 ♖xe6+ ♖xe6

37 ♖d4 ♗xd4

The ending Kasparov strives for looks promising but White ultimately has sufficient resources. It may be better to avoid the exchange here, but any kind of knight swing is, of course, far less dangerous with the rooks absent from the seventh rank. If 37...♗c5 White appears to be okay after 38 ♗b3! ♗xb3+ 39 cxb3 ♖e8 40 ♖f1 ♖xe5 41 ♖f7+ ♖b6 42 ♖xg7.

38 exd4 ♖xd4

39 ♖g1 ♖c4

40 ♖xg6 ♖xc2

41 ♖xg7+ ♖b6

42 ♖b3+ ♖c5

43 ♖xa7 ♖f1+

Stronger than 43...Re2 44 h5 ♖f1+ 45 ♖b1 ♖xb1+ 46 ♖xb1 ♖xe5 47 h6 ♖h5 48 h7 ♖c4 49 ♖c7 c5 50 a4. In this extraordinarily difficult position, Kasparov takes what is probably the best route. In such a knife-edge position, it is easy for Black to suddenly fall into danger.

44 ♖b1 ♖ff2

45 ♖b4

White now threatens checkmate, so Black's hand is forced.

45 ... ♖c1+

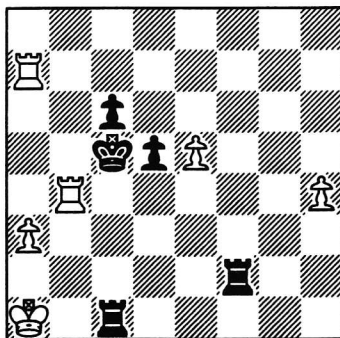
If 45...♖a2+ 46 ♖b1 ♖xa3 47

♖xa3 ♖xb4 48 ♖h3 will draw.

46 ♖b1 ♖cc2

47 ♖b4 ♖c1+

47...♖a2+ 48 ♖b1 ♖xa3 49 ♖xa3 ♖xb4 looks nice but it doesn't seem to make progress after 50 ♖h3 ♖e2 51 h5 ♖xe5 52 h6 ♖e8 53 h7 ♖h8 54 ♖c2.



48 ♖b1 ♖xb1+

49 ♖xb1 ♖e2

50 ♖e7 ♖h2

51 ♖h7 ♖c4

52 ♖c7

53 e6 ♖xh4

54 e7 ♖e4

55 a4 ♖b3

56 ♖c1 ½-½

One possible drawing variation is 56...c4 57 a5 c3 58 ♖d1 d4 59 a6 d3 60 a7 d2 61 ♖b7+. A truly exhausting and frustrating game for the world champion.

Score

	1	2	3	4
Kasparov	1	0	½	½
Deep Blue	0	1	½	½



□ Kasparov ■ Deep Blue  
**Saturday, 10 May**  
**King's Indian Attack**

### **Fear Itself**

*'I think the computer is getting to him. It's not the Garry I know.'*  
– Mike Valvo

By game five, the touts had appeared. \$25 tickets were going for \$50, if you could find them. One fan even stood outside the Equitable Building with a sign saying 'I need tickets'. Of course, Saturday's game was Kasparov's last outing with the white pieces and, therefore, his best – perhaps last – chance to seize the lead in the contest. The big question, whether the world champion would choose a modest opening, or go in with all guns blazing, was answered when Kasparov repeated the quiet, creeping Réti opening that had proved so lethal in game one.

The world champion varied early, but it was Deep Blue who hit us with the first real surprise, unleashing the very un-computer-like ...h7-h5 pawn thrust to weaken White's kingside. 'Deep Blue is not afraid,' Benjamin told reporters. 'It's playing Garry Kasparov, but it doesn't know it's playing Garry Kasparov. It just wants to play the best move.'

In a complex up-and-down battle, Kasparov finally emerged with a strong endgame advantage and a difficult-to-stop passed pawn on the g-file. Just as observers began sensing a possible win for White, Deep Blue rocked the auditorium. Refusing to rush its pieces back and de-

fend, the computer dismissively grabbed White's queenside pawns to create a dangerous passed c-pawn of its own. The crowd cheered and clapped as Kasparov pushed his g-pawn up the board. But in a nail-biting finish, and with the world champion's pawn one move from queening, the computer forced a draw by perpetual check.

*Game 5*  
**Kasparov-Deep Blue**  
**King's Indian Attack**

- 1 ♖f3 d5  
 2 g3 ♗g4  
 3 ♗g2

Reverting to his successful formula from game one, though with the slight variance of playing ♗g2 rather than b2-b3 at this stage.

- 3 ... ♘d7  
 4 h3 ♗xf3

In this line capturing on f3, and then trying to blot White's king's bishop out of play with a central pawn barricade on the light squares, is a perfectly acceptable strategic alternative to dropping the bishop back with 4...♗h5. At the 5.00pm briefing Dr Feng-Hsiung Hsu indicated that Deep Blue had traded bishop for knight because it considered that it led to a slight lead in development for Black.

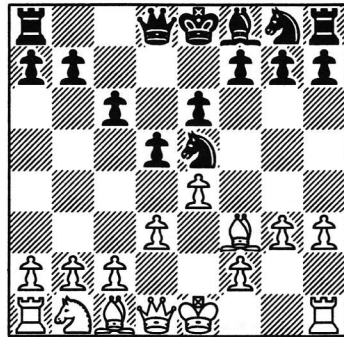
- 5 ♗xf3 c6  
 6 d3 e6  
 7 e4?

With this move White forfeits much of the flexibility of his opening structure. Perfectly rea-

sonable alternatives are 7 d4 or 7 ♘d2, then to be followed by e2-e4.

- 7 ... ♗e5

This looks somewhat naïve but the attack on White's bishop gains Black a lot of time.



- 8 ♗g2 dxe4  
 9 ♗xe4

9 dxe4 allows either 9...♗b4+ or 9...♗xd1+ when White has very little. The text, though, exposes White's king's bishop to further harassment.

- 9 ... ♗f6  
 10 ♗g2

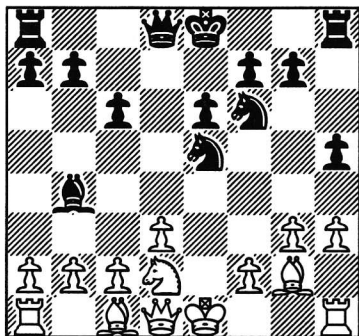
Amazingly, from White's first ten moves, no less than five have been made with the hyper-active king's bishop. Although White has the advantage of the bishop

pair, the pawn structure is not complex and Black's development is excellent. So, as in games two and three, the opening cannot be declared a particular success for the human side.

10 ... ♖b4+  
11 ♘d2

Deserving of consideration is 11 ♘c3. Meanwhile, of course, 11 c3, which is strategically desirable, would fail to 11...♘xd3+.

11 ... h5



Fascinating aggression by the computer, when one might have expected the simple 11...0-0. It made a tremendous impression at the time and certainly surprised Kasparov. Of course, the move may simply have been made to maximise the radius of activity of Black's king's rook. However, it definitely appears that if the machine had the long term goal of trying to undermine White's kingside with ...h4.

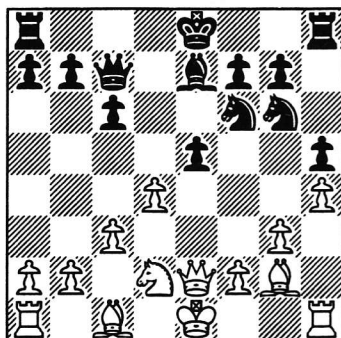
12 ♚e2 ♚c7

13 c3 ♙e7  
14 d4 ♘g6  
15 h4

A necessary measure to prevent Black striking at the dark squares with the further advance ...h5-h4.

15 ... e5

Just in time, before White plays ♘c4. Now 16 dxe5 ♚xe5! Would leave White with nothing.



16 ♘f3 exd4  
17 ♘xd4

White could play 17 cxd4, voluntarily accepting the weakness of an isolated queen's pawn, in order to retain control over e5, and thus restrict the movement of Black's knight on g6. Nevertheless, in that case, 17...0-0-0 18 0-0 ♘d5 gives Black a solid position.

17 ... 0-0-0  
18 ♙g5

White's problem is his lack of development, which would be

accentuated if Black were to play ...♖he8 unmolested, with designs against the white queen. In view of this, White can hardly hope to retain his bishop pair. The text plans to castle queenside, but White's king is not particularly secure there so the simple 18 0-0 might have been better. The square f5 could be a useful one for White's pieces and if Black ever plays ...♘g4 White could parry with a combination of ♘f5 or ♙h3. Note that the immediate 18 0-0 ♘g4 fails to the trick 19 ♘e6! fxe6 20 ♖xe6+ and ♖xg6.

18 ... ♘g4

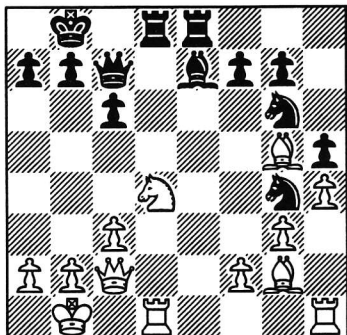
19 0-0-0 ♖he8

Not 19...♙xg5+ 20 hxg5 ♖a5 21 ♖xh5 ♖xh5 22 ♖xg4+ and White wins.

20 ♖c2 ♗b8

If 20...♙xg5+ 21 hxg5 ♖a5 forking two pawns then 22 ♖xh5 when 22...♖xa2 fails to 23 ♖f5+.

21 ♗b1



Here both sides indulge in the standard Deep Blue safety move with the king, which has occurred so frequently before in this match.

21 ... ♙xg5

Black hastens to deprive White of the bishop pair before White retreats with ♙c1, made possible by his previous move.

22 hxg5 ♘6e5

After this the risky pawn grab 23 ♖xh5 can hardly be countenanced, since White has too many pieces hanging and his king may end up the victim of a deadly check along the b1-h7 diagonal. A sample variation would be 23 ♖xh5 c5 24 ♘b5 ♖b6 25 ♖xd8+ ♖xd8 26 ♘a3 ♘xf2 and White cannot recapture on account of ...♖g6+.

23 ♖he1 c5

Although this allows White's bishop into the game, it is important to keep White on the run. Kasparov never quite succeeds in establishing the kind of strategic grip he is looking for.

24 ♘f3 ♖xd1+

25 ♖xd1 ♘c4

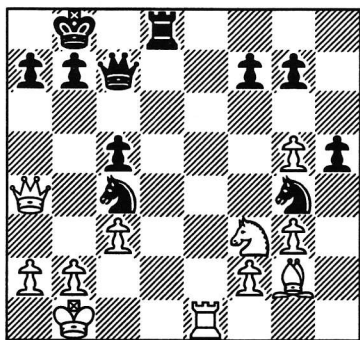
26 ♖a4

Has the machine blundered, allowing a fork?

26 ... ♖d8

Of course not. For if 27 ♖xd8+ ♖xd8 28 ♖xc4 ♖d1 checkmate.

27 ♖e1

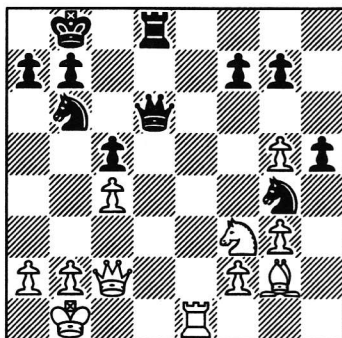


Thwarted in his brief belief that material gain was possible, Kasparov evades the rook trade and occupies the only other open file. In contrast the passive 27 ♖f1, protecting his perennial weakness on f2, could well get his pieces into a tangle after 27...♗g5 for if 28 ♘xe5 ♘d2+ and it is Black that wins material. In general it is quite a nightmare (pun intended) facing the computer when it has two active knights, liable to hack off a piece of the white position with virtually no notice.

27 ... ♗b6  
 28 ♖c2 ♖d6  
 29 c4

Kasparov really screwed this move into the board. The position has been predominantly tactical for some time, but with this move, Kasparov tries to impose his strategic stamp. In particular, the pawn on c4 shuts out Black's knight on b6 which was

earlier causing so much trouble. Indeed, Deep Blue now has to go to extraordinarily imaginative lengths in order to reintroduce this piece into the game.

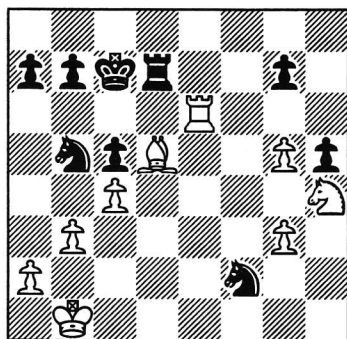


29 ... ♖g6

Accepting weak pawns but reducing White's defence of both f2 and c4. Another idea, which is possibly an even better try is 29...♖d3. This sets a diabolical trap, namely 30 ♖xd3 ♖xd3 31 ♘e5 ♘xe5 32 ♖xe5 ♖d1+ 33 ♖c2 ♖d2+ 34 ♖xd2 ♘xc4+ 35 ♖c3 ♘xe5 36 f4 when Black has won a pawn. However White's general activity in this endgame ought to be enough to hold the draw. An alternative for White after 29...♖d3 is 30 ♖xd3 ♖xd3 31 ♖e7 ♖d7 32 ♖xd7 ♘xd7 33 ♖h3 when a draw is still the most likely outcome. Finally 30 ♖xd3 ♖xd3 31 b3 ♘xf2 32 ♖e7 ♖d7 33 ♖e8+ ♖c7 34 ♘e5 ♖d2 35 ♘xf7 ♘d3 and a draw is still likely.

30 ♖xg6 fxg6  
 31 b3 ♘xf2  
 32 ♙e6 ♕c7  
 33 ♙xg6 ♙d7  
 34 ♘h4 ♘c8  
 35 ♙d5 ♘d6  
 36 ♙e6 ♘b5

Typical Deep Blue, maximising its tactical scope with an unexpected coup. Although Kasparov has a nominal advantage, due to Black's weak kingside pawns, material is so reduced, as in game four, that a White win is unlikely. Without 36...♘b5 Black's position would be perilous, but after White's forced capture on the next move, Black has considerable counterplay with his queenside pawn majority and active rook and knight. Deep Blue's real achievement in coming play, though is the creative use of its king.



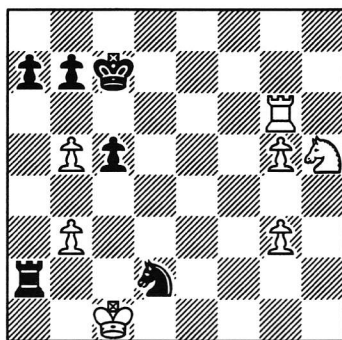
37 cxb5 ♙xd5  
 38 ♙g6 ♙d7  
 39 ♘f5 ♘e4

40 ♘xg7 ♙d1+  
 41 ♕c2 ♙d2+  
 42 ♕c1 ♙xa2

A vital move, in conjunction with its 43rd, to hoover off White's pawns on the queenside and create a passed c-pawn.

43 ♘xh5 ♘d2!!

The key move in Black's defence and much better than the conventional 43...♙g2, for example 44 ♘f6 ♘xg3 45 ♘d5+ ♕d7 46 ♙g7+ ♕c8 (not 46...♕e6 47 ♘f4+) 47 ♙c7+ and White is well on top. Deep Blue has calculated a beautiful draw. By the way, after the game Kasparov stated that he had already seen by move 40 that this draw was inevitable.



44 ♘f4?!

Much excitement was generated, especially on the Internet, about the alternative 44 ♙e6 which has the goal of immediately unblocking the promotional path of White's g-pawn.



Even in this case, though, the fact that White's king is trapped on the back rank gives Black adequate defensive resources, 44...♟xb3+ 45 ♔b1 ♖h2! and now 46 ♜f6 ♞d2+ 47 ♔c1 ♜b3+ and White is forced to repeat moves as 48 ♔d1 loses to 48...♖h1+ followed by ...♞d4+. The same defence occurs after 46 ♜f4.

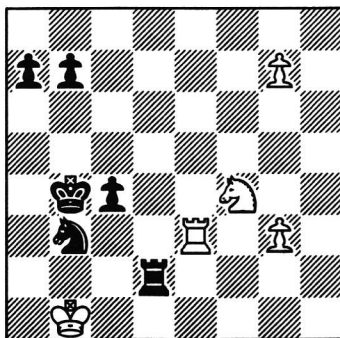
44 ... ♟xb3+  
 45 ♔b1 ♖h2  
 46 ♖e6 c4  
 47 ♖e3

To stop ...c4-c3.

47 ... ♔b6  
 48 g6 ♔xb5  
 49 g7 ♔b4

And not 49...♞d8 50 ♖e5+ with the plan of ♞d5 and ♖g5 and if necessary ♜f6. Here a draw was agreed on account of 50 g8♜ ♞d1+ with perpetual check.

½-½



**Score**

	1	2	3	4	5	
<b>Kasparov</b>	1	0	½	½	½	2½
<b>Deep Blue</b>	0	1	½	½	½	2½

In the final moves of the game, Kasparov's demeanour at the board changed. Looking angry, almost bug-eyed, when the game ended, he remained seated at the board and began speaking in Russian to his mother who was off-camera in the studio. 'Can anyone read Russian lips?' Valvo inquired of the audience. The playing room suddenly filled with people. First Kasparov's second, GM Yuri Dokhoian, then Dr Tan, then Freidel. Finally Ken Thompson, the member of the appeals committee who monitored the Deep Blue war room, joined the group, suggesting that the Kasparov camp was making a protest. Kasparov shook Tan's hand and continued an animated conversation with his mother. After several more minutes of chaos, an angry looking Kasparov finally came down to the auditorium and was greeted with wild cheering and a long, long standing ovation. As kids

punched their fists in the air and shouted ‘Garry, Garry’, Kasparov remained pretty emotionless and looked grim on stage. It seemed the audience was trying, unsuccessfully, to find a way to rally their champion out of his mood of doom and gloom.

*Ashley:* Garry, it’s clear who the crowd is rooting for – who humanity is rooting for. What happened today?

*Kasparov:* That was a very exciting and probably the cleanest game in the match. I was very much amazed by ...h7-h5. (Audience laughter.) Many, many discoveries in this match, and one of them that sometimes computer plays very human moves. ...h7-h5 is a good move. I have to praise the machine for understanding very, very deep positional factors. I think it’s an outstanding scientific achievement.

The reason I was staying longer in the hall... Deep Blue’s scoresheet must be locked by the end of the game.

[Here, Kasparov was referring to the fact that the game two print-out, which he had been concerned about all week, was not sealed until several days after the game ended.]

*Kasparov:* ...But anyway the game was very tough, and at one point we reached the position that is very, very dangerous when you play the machine. I had not much time, and at one point I was very worried when the machine played 23...c5. (It was) very, very close, and it seemed I managed to escape by a miracle.

At this moment the Deep Blue team came on stage. Facing the most partisan crowd of the contest, they received a smattering of applause, but also a good deal of jeering and booing. It was their first mixed ovation of the contest.

*Ashley:* Allow Garry to finish his point.

*Kasparov:* I was very worried at one point, you know, but when I played 29 c4 I felt that I was out of danger, and at that time it didn’t play the same positional game as before and suddenly White got slight advantage in the endgame. And again it was very, very close and I have to say it was a miracle that Black eventually was saved. I saw it on move 40. I saw it was a perpetual but there was nothing to do, because all the moves are forced. I mean you know, it’s a normal result. When two sides play well the game is draw. At least there are no more resemblances to Philadelphia.

Still it’s a tough match and tomorrow I will have to face another difficult challenge. I play Black and all the games with Black have been very difficult for me here. But if I play as well as I played today

and in game 4, I hope that I can still manage. And hopefully the only thing I'll try to keep from doing is not to resign in advance. (Audience laughter, applause.)

*Ashley:* Your feeling, C. J. Tan, do you have any idea on how your baby is doing at this point?

*Tan:* I think the baby is doing very well, and I'd like to congratulate Garry and also the Deep Blue team. As the match progresses every game is better than the previous one, so I'm sure tomorrow the game will be probably the best game of all in the six-game series.

*Kasparov:* It sounds like a very warning, you know! Very warning.

*Ashley:* Garry you felt that some piece of humanity was at stake in this match. How are your feelings now? You've been in many, many, many big games – more than we can even add up right now. Tomorrow's game. Same feelings?

*Kasparov:* It's an important game, but it's probably more for the outside world than for me. I am playing a chess match, I felt really shaken after game two, and there were other factors than simply losing the game, and obviously the result of game two had its impact on game three and four – being completely disassembled after game two. I thought I would win one (more) game, either three or four, but it took time for me to recover and I managed to survive game four.

I said in the beginning that it would be very difficult for me to do any preparation, you know, I face an opponent that can play any opening. It has an enormous library, knows everything and I have to take a very cautious approach, because I have a good memory. I probably know more about opening theory than any other chess-player, but I don't want to compete with something that is far, far superior to me in this contest. Also, I have to be afraid because I can out-calculate any player in the world easily, but I cannot out-calculate the machine. I can see longer, on some decisions, like in game one and also today, probably.

... But, when some people say that I'm afraid – Grandmaster Illescas of the Deep Blue team said that 'I'm afraid and he knows that I'm afraid and he's not afraid to say I'm afraid' (Audience laughter.) – I'm not afraid to admit that I'm afraid, and I'm not even afraid to say why I am afraid, because sometimes, you know, it definitely goes beyond any known program in the world. It makes decisions that still cannot be made by any computer, and facing such a challenge

with virtually no preparation before the match, I have to be extremely cautious, and I think, with one exception, game two, I think I have managed quite well. And in fact if I hadn't resigned game two, that would have been a draw. The good thing up to now is that the computer hasn't won a game; I lost one. (Audience applause.)

*Asbley:* I'm hearing you speak, almost as if the match is over, but it's a big, big game tomorrow. Are you going to try to win tomorrow, or –

*Kasparov:* I'll try to make the best moves.

### **The Arbiter's Song**

After several minutes of rumour and counter-rumour, carried on against the background of journalists rushing to meet deadlines (it was, after all, way past midnight in Europe), match arbiter Carol Jarecki came up to the 50th floor with copies of both sides' original scoresheets. Surrounded by reporters, she explained the furore after the game. For several days, and again that morning, the Kasparov team had asked that the Deep Blue 'printouts' – which featured the computer's analysis and judgements of lines it explored the fullest – be sealed until after the match, presumably to avoid any possibility of tampering. After game five, Kasparov repeated this demand to her several times. 'It's like Watergate,' she said. Jarecki told reporters that IBM had now agreed to Kasparov's demand and the game five printouts – which took 12 minutes to print and contained 72 pages – were safely in the briefcase she was holding. 'I'll tell you one thing,' she said with an air of amused understatement. 'This match is a lot more exciting than the (Kasparov-Anand) world championship.'



□ Deep Blue ■ Kasparov  
Sunday, 11 May  
Caro-Kann Defence

### The Bluest Day

*'Forget the prize money. The fate of humanity is on the line, at least in Garry Kasparov's head. Man, why did he set himself up like that?'*

– Maurice Ashley

*'I lost my competitive spirit.'*

– Garry Kasparov

Moscow, November 9, 1985. Seville, December 18, 1987. A decade before the Deep Blue rematch, Garry Kasparov had already faced a career's worth of big games. Playing under extraordinary pressures and for the highest stakes, his nerves had never cracked, and he won them all. That is, until now.

In an astonishing moment, at once tragic and historic, the greatest player in history transposed his opening moves in a well-known variation of the Caro-Kann Defence, allowing Deep Blue to unleash a devastating attack straight out of its memory banks.

Kasparov played his early moves slowly, and appeared to be taking care. Indeed, he sat for almost two minutes before producing 7...h6?? instead of the familiar 7...♘d6 followed by 8...h6. Deep Blue replied instantly with the correct book move, a knight sacrifice, and a startled Kasparov began to shake his head and roll his eyes. After a flurry of moves, Deep Blue was still down on material, but with a powerful

attack against Kasparov's king, stranded in the middle of the board.

Affected by the extraordinary tension, Deep Blue operator Joe Hoane initially touched the wrong piece when executing the follow-up move. But when White's light-squared bishop did finally hit the g6 square, Kasparov was forced to move his king away. 'You saw his reactions,' said Seirawan. 'The moment that Deep Blue played 8 ♖xe6 so very quickly and reached the position they now have on the board, he was in justifiable terror, distress. Because he recognises that he's fallen for a well-known opening trap.'

In the press room, experts began wondering how such an extraordinary error could have come about, or even if it was really an error at all. Could it be that Kasparov was so worn down, so shaken, so psyched-out by the computer that his mind just wasn't really there when he picked up the h-pawn? For others, the sight of the great Kasparov, and his legendary memory, forgetting such a well-known move order, was inconceivable. And they began suggesting that the world champion must have something prepared – some kind of surprise, tricking Deep Blue into automatically making a book sacrifice that it wouldn't know how to follow up. Perhaps, they said, it was some kind of massive chess gamble, with Kasparov taking on a risky position, in the hope that the computer might miss some hidden nuance down the line. Evidently, this guess was nearer the mark than might have been thought, and anyone armed with the *International Computer Chess Association* journal for March 1997 (see the postscript to this game) would have been justified in reaching this conclusion.

Whatever one's theories, it became increasingly harder to argue with the high drama unveiling before us all. An ashen-faced Kasparov pulled his hands through his hair, then over his face to cover his eyes. Shaking his head, he looked down to the floor, as if he were waiting for the ground to open up and swallow him whole.

The world champion tried to twist his way out of trouble, but with only six minutes used up on its clock for 12 moves, Deep Blue flicked out a clever pawn advance that undermined Black's queenside defences. Four moves later it followed with a brilliantly subtle queen move, 'human-like' in its decision to increase the pressure on Black's position, rather than gang up on the e-pawn and trade down into an unclear endgame.

As the computer moved in to surround and snatch Black's queen, Kasparov put his famous watch back on, a well-known signal that the

game would soon be over. His look became more and more resigned and he began speaking aloud and looking off stage.

After Deep Blue's 19 c4, Black could surely have hung on slightly longer. But Kasparov, evidently, couldn't take any more punishment. He surrendered the game and rushed out of the studio, leaving his scoresheet unsigned until after the subsequent news conference.

This almost unbelievable turn of events shocked and confused press and public alike. Since Kasparov knew he had resigned prematurely in game two, they asked, why didn't he at least fight on for a few more moves now? But chessplayers, who'd been hoping for a brilliant Kasparov victory, or, at least, a solid draw leaving man and machine tied at 3-3, knew the answer. After a career packed with a seemingly endless series of triumphs, Kasparov had fallen victim to an all too human weakness. He cracked. As Rosa de las Nieves of *El Mundo* said: 'Today was Kasparov's bluest day.'

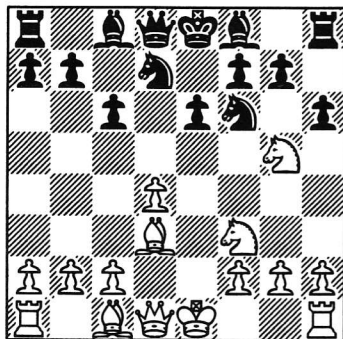
*Game 6*  
**Deep Blue-Kasparov**  
Caro-Kann Defence

1	e4	c6
2	d4	d5
3	♘c3	dxe4
4	♗xe4	♘d7
5	♗g5	♗gf6
6	♙d3	e6
7	♘1f3	h6??

In the notes to this game we have tried to recreate the panic and horror which reigned in the press room when Kasparov chose a move which is widely condemned. Nevertheless, for an alternative view, see the discussion that follows..

Although this move may be playable it is an extremely risky try for a decisive match game, and if the world champion did

not intend to play it the situation is psychologically equivalent to allowing a Fool's Mate. This move has been condemned for years, with 7...♙d6 being the standard move, e.g. 8 ♖e2 h6 9 ♗e4 ♗xe4 10 ♗xe4 ♗f6 11 ♗e2 with approximate equality as in Kamsky-Karpov, FIDE World Championship, Elista 1996.

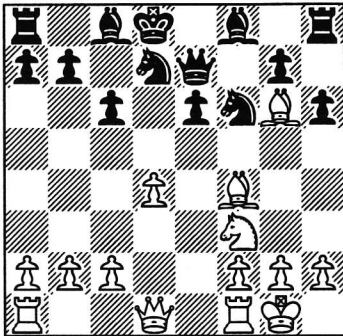


This sacrifice gives White an overwhelming attack, and Kasparov knew it. He must have wanted to resign at once. The point is that the immediate 8...fxe6 allows 9 ♖g6+ ♔e7, with Black's king marooned in the centre and his pieces virtually incapable of being developed. It is an utter mystery why Kasparov tried to resuscitate this condemned line.

8 ... ♔e7  
9 0-0 fxe6

And not 9...♗xe6 on account of 10 ♖e1 winning Black's queen.

10 ♖g6+ ♔d8  
11 ♖f4



11 ... b5

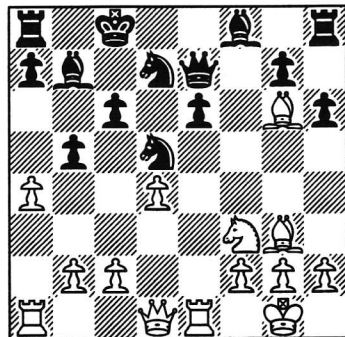
One of the earliest examples of this line, which rapidly established it as virtually winning for White, was Chandler-Hübner, Biel 1987, which went 11...♘d5 12 ♖g3 ♗b4 13 ♖e1 ♖e7 14 ♗e2 ♖f6 15 c4 and White won in 27

moves. Black's problem is that, although he is a piece ahead, his king is never safe. Another game which resulted in the condemnation of this line was Geller-Meduna, Sochi 1986, which continued 11...♗b4 12 a3 ♗xb2 13 ♗e2 ♘d5 14 ♖d2 and White went on to win in 36 moves. Of course, all of this would have been in Deep Blue's database.

12 a4 ♖b7

Black's last chance is 12...b4 to keep lines closed on the queen-side. However, after 13 c4 Black is still lamentably short of squares for his pieces. One brutal white threat is c5 followed by ♖d6, trapping Black's queen while if 13 c4 bxc3 14 bxc3 the avenue for attack created by opening the b-file would be just as dangerous as the open sore of the a-file turns out to be in the game.

13 ♖e1 ♘d5  
14 ♖g3 ♔c8





Black's king tries to flee the danger zone, but this is really a futile gesture since White's raking bishop on g3 cuts off any hope of escape.

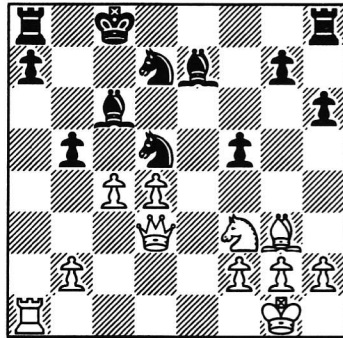
- 15    **axb5**    **cxb5**
- 16    **♖d3**    **♙c6**
- 17    **♙f5**    **exf5**
- 18    **♜xe7**    **♙xe7**
- 19    **c4**    **1-0**

Deep Blue transcends the normal computer love for material and avoids 19 ♖xf5 which might have allowed Black to consolidate his ragged forces.

White's 17th move swapped bishop and rook for Black's queen but although Black still enjoys a modest material advantage, his position is so utterly disorganised that he cannot stem the flow of White's attack, e.g.

19...bxc4 20 ♖xc4 ♔b7 21 ♖a6 checkmate or 19...♗b4 20 ♖xf5 bxc4 21 ♗e5 ♜d8 22 ♗xc6 ♗xc6 23 ♖f4 with decisive gains.

Disgusted with himself and discouraged by White's fresh impetus, heralded by this thrust Kasparov now threw in the towel.



**Score**

	1	2	3	4	5	6	
<b>Kasparov</b>	1	0	½	½	½	0	2½
<b>Deep Blue</b>	0	1	½	½	½	1	3½

**Putting on the Fritz**

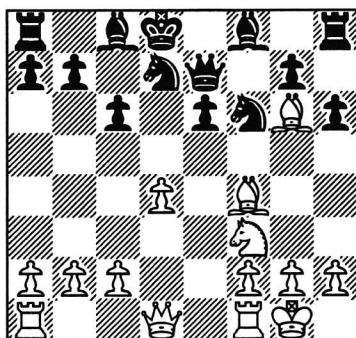
The notes above have sought to convey Kasparov's desperation at suddenly finding himself in a line he had not prepared and probably did not even intend to play. 7...h6 may, indeed, even have been a finger-slip. Nevertheless, there is another side to the story, a scientific one, if not one that accurately reflects the psychological reality on the day.

In October 1996 at Jena in Germany grandmaster Gennadi Ti-

Timoshchenko, formerly Garry Kasparov's second, contested a match against a combination of the Fritz computer program and human minder called Ingo Althöfer. The match was ultimately won by the symbiotic Fritz/Althöfer tandem by 4½-3½. In one game of this match, Timoshchenko risked exactly the same variation, as Black, with which Kasparov suffered such a débâcle in game six.

In the *International Computer Chess Association Journal* of March 1997, Timoshchenko published his game and his detailed conclusions on the sacrifice which included the verdict: 'After the knight sacrifice, Black has enough possibilities for defence.' It is surprising that Kasparov's preparation should have overlooked Timoshchenko's conclusions in this prime source for information on computer advances. And it is more surprising that Frederic Freidel, a developer of Fritz and Kasparov's adviser on computer affairs, should not have drawn Kasparov's attention to this article, if Kasparov was planning to defend with the Caro-Kann.

Broadly speaking, Timoshchenko writes that the position after 11 ♖f4 is defensible for Black.

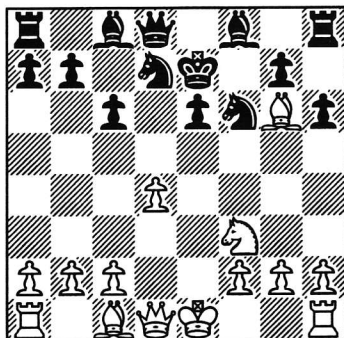


Here Kasparov played 11...b5. Fritz/Althöfer-Timoshchenko, Jena 1996 continued 11...♞d5 12 ♖g3 ♜b4 13 ♜b1 ♞e7 14 c3 ♜a5 15 ♖h4 ♜c7 16 ♖g3+ ♜d8 17 ♖h4 ♜c7 with equality.

Of course, White's 13th move novelty deviates from the most dangerous theoretical tries, but Timoshchenko suggests that there is an answer for everything. For example, 13 ♜e2 ♖e7 14 c4 ♞5b6 15 b3 ♖f6 16 ♞ad1 ♜e7 17 ♞fe1 with compensation for the knight, but no clear win. Alternatively, 13 ♞e1 ♖e7 14 ♜e2 ♖f6 15 c4 ♞e7 16 a3 ♜b3 17 ♖d3. This is Chandler-Hübner, Biel 1987 but here Ti-

Timoshchenko quotes analysis by the Australian grandmaster Ian Rogers suggesting that 17...♟f8 18 ♞ad1 ♙d7 19 ♘e5 ♙e8 is still playable.

Furthermore the early alternative 8...♙e6 9 ♙g6+ ♚e7 is not nearly as bad as Kasparov must have believed it to be.



Timoshchenko's article quotes none less than Anatoly Karpov as giving 10 0-0 ♜c7 11 ♞e1 ♙d8 12 c4 (or 12 ♞xe6 ♙d6 13 ♞e1 ♘f8 14 ♙d3 ♙g4 which is better for Black) 12...♙b4 13 ♞e2 ♘f8 14 ♘e5 ♘xg6 15 ♘xg6 ♞e8 16 c5 ♜f7! 17 ♘e5 ♜h5 18 ♘c4 b5 with Black on top. This turns out to be analysis by the Peruvian grandmaster Granda Zuniga from his Black win against Patrick Wolff at New York in 1992.

Timoshchenko describes this whole variation as quite unclear; a possible improvement for White is 11 c4 ♙d8 12 ♜e2 ♙d6 13 ♞d1 ♘f8 14 ♙c2 as in Fogarasi-Szabolsci, Hungary 1995, though this game ended in a draw.

If Kasparov had been aware of Timoshchenko's article and had properly prepared his defence, it might well have proved that allowing, indeed, provoking White's sacrifice on move eight could have turned out to be a master-stroke, leading to an unbalanced position, in which victory for both sides was still possible. At the very least, someone in Kasparov's camp should have regarded the ICCA Journal as required reading and ensured that Kasparov was cognisant of all its most recent discoveries.

# Look Back in Anger

*'I saw the last game of the Kasparov-Deep Blue match and the news conference that followed. Although Garry Kasparov lost the match, he won the news conference. It was not a pretty sight.'*

– Joseph F. Traub, a Columbia University computer science professor, in a letter to the *New York Times*, 12 May

About 15 minutes after throwing in the towel, the world champion arrived at the press centre on the 50th floor and took his seat on the podium. C.J. Tan arrived a few minutes later with the rest of his team. Tan sat next to Kasparov; the other Deep Blue team members sat in the front row of the audience, diagonally across from the world champion. Tan and Kasparov said nothing. And for several minutes a dazed and glazed Kasparov stared blankly out over the audience and into space.

Here is an edited transcript of 'Monty Newborn's Flying Circus', the press conference given immediately after the final game.

*Newborn* The appeals committee had some complicated issues to resolve regarding questions that Garry had raised on what information would be available to him during the course of the match about the Deep Blue program. As well, Garry had some serious questions about moves that seemed beyond what the computer was capable of doing. And the task of examining the computer printout during the game was the responsibility of Ken Thompson.

Throughout the games Ken monitored the TV screen, watching every move that Deep Blue played, and Garry couldn't believe a couple of moves. And at one point he requested a printout from two particular moves. Ken analysed the printout and reported back to the Kasparov side that he saw no irregularities, and the issue seemed resolved.

I would like to point out that the question of determining whether there's a spirit in the computer that came up with those moves which none of us could understand is a very difficult one. The amazing thing for many of you here that aren't intimately involved in computers is that it would be almost impossible to expect the computer to play exactly the same way again. The interaction between the many parallel computers will cause one computer to talk to the other one, slightly before the other one talks to the next one, if the game is played again, and information will almost never again propagate in exactly the same way. And the small differences in the sending of information around the system will result in different moves being made, if one attempts to repeat. Maybe one in ten, or maybe one in 20 moves, will be impossible to repeat. So we faced very serious questions here, and I hope that we've resolved them satisfactorily at this point.

*Tan:* (Pulling out a prepared statement.) Thank you, Monty. We on the IBM Deep Blue team are indeed very proud to have played a role in this historic event. And this is a match that will benefit everyone, from the students who sat in the audience, learning from Garry and Deep Blue, to many consumers outside this building who will be deeply affected by this advance in technology. And we would like to thank Garry Kasparov, one of the world's most brilliant minds, and a very brave man, for participating in this great experiment with all of its profound implications. And Garry is a man who sees the future, who understands where technology can take us. Playing with him gave meaning to this event.

Now that the rematch is over, where do we go from here?

Well, we will continue our partnership with Garry, but perhaps on a less competitive level. We will be working with Garry in the development of his newly launched website, Club Kasparov, where he will share his chess brilliance with the world, and especially students all over the world.

The match was tough on both of us. There have been highs, there

have been lows. And we even had to take Deep Blue for a walk yesterday morning.

What we have left to do now is perhaps to program Deep Blue to see how it can learn to take off its watch in the next match.

So again, I would like to thank Garry and all of you that participated in this event with us. Thank you.

(Applause.)

*Newborn:* At this point it's my pleasure to introduce Garry Kasparov, who will address you, and I can only say that at the conclusion of this exciting match I would have loved to have seen both players win, but Garry, you have my admiration for a long time to come. (Lengthy applause – Garry raised his hand to quieten the audience.)

*Kasparov:* Enough. Sorry, I don't deserve that. And I have to apologise for today's performance, but I don't think it had anything to do with chess and with the match. I think Maurice Ashley made a very good statement yesterday when he said that I sounded as though the match was over. And for me the match was over yesterday, and I have to tell you that I had no real strength to fight, and I think the result of the so-called game today was quite justified.

The match was lost by the world champion, but I think there are very good and very profound reasons for such a result.

I was a bit surprised to hear from C.J. that now they would like to cooperate on a less competitive level. I think the competition has just started. (Applause.)

I made one big mistake before this match. I hoped, and I had no doubt, that the spirit of the event would be no different from the one that took place in Philadelphia last year.

Soon I recognised that this was a grave mistake, with all the consequences that I have to pay at the end of the match, and in the middle of the match.

It was nothing to do with science. It was nothing to do with further investigation of the potential of computer chess. There was one goal, to beat Garry Kasparov. And when a big corporation, with unlimited resources, would like to do so, there are many ways to achieve the desired result. And the result was achieved.

I lost the match before I resigned today. I think the crucial game was game two. And again, Mr Newborn, I have to tell you that it is not up to you or Mr Thompson to make a judgement as to whether

computer can play this move or not. This is obviously beyond our understanding.

Deep Blue is so complex and I recognise the complexity of this machine, all the interconnections that it will never come up with the same result, even if you run the test, again, again, and again.

But what is most amazing is that, as we saw in game one and in a couple of other games, Deep Blue still has generic computer problems. And I'm sure that it is not up to the people in this room, not to me, not to the Deep Blue team, to say that it was absolutely correct and perfect.

I believe that these printouts, if they are of course available, will be studied by all chess fans, all computer and chess specialists around the globe, and I think that in two or three weeks other powerful computers will tell us whether any other machine can do the same things as Deep Blue did in this match. My personal feeling is, I doubt it.

But again, we faced a machine that made moves that were beyond anybody's understanding. And I couldn't have anticipated this before I started to play.

I have to tell you that game two had dramatic consequences and I never recovered after this game. Not because I lost this game. In fact, I could have made a draw instead of resigning.

But because there were two major issues that are not yet resolved. Whatever people are saying here, I still do not understand how the most powerful and great machine couldn't see a simple perpetual check at the end of the game.

I'm sure there will be answers provided. I'm sure there will be a lot of analysis later on. I'm sure I'm in wrong position today to complain, because it will be written tomorrow that Garry Kasparov couldn't lose properly, couldn't be a sportsman to accept his defeat. I can even name the newspaper that will write this line tomorrow.

Yes, so be it, you know. Again, I understand – I fully understand – all the consequences of the result of this match.

But I think it's very important for all of us to state today that Deep Blue must now enter competitive chess. You know, have all the team, but play a normal event, play a candidates tournament, play a world championship match, under proper conditions, and the scrutiny that every chessplayer has to go through. Play competitive chess, and we shall see whether this machine is a prodigy, is a unique piece, or whether it was a lot of human weaknesses shown in one very par-

ticular event.

I think it's time for Deep Blue to prove that that was not the only event it could play. I think it's time for Deep Blue to start playing real chess.

And I personally assure you, everybody here, that if Deep Blue starts playing competitive chess, I personally guarantee you, I'll tear it to pieces without question. However many players they hire. They will have to put more players on the bench, of course, because some of them will probably be too shy to show up. They can hire the entire GM force of the United States of America. It will not help, because we know how the machine plays. Put it into competitive chess, put it in a fair contest, not just one, make IBM a player, not a sponsor at the same time, and we will see what happens.

And I think that this is just the beginning. And I have to apologise again, I am ashamed by what I did at the end of this match.

But so be it. I feel confident that the machine hasn't proved anything yet. It's a much better machine than in Philadelphia, as was clear from day one. But it's not yet ready, in my opinion, to win a big contest. That's my belief.

And again, you can trust me; you can define me as a loser, I deserve that to some extent, but I think it's just the beginning. Thank you. (Audience applause.)

Kasparov responded to the first question.

*Kasparov:* I suggested that there were things in this match well beyond my understanding and the understanding of many people, and I can assure you that probably there is no way to prove that Deep Blue is making this move or that move, but I think it will be wise – for everybody who is curious – to run the tests. There are very specific positions, very similar positions in one game, just take only one game, game two, and I would like to run it, it will take maybe a week or two weeks, but everybody can come up with a conclusion. If, at the end of the day, in two or three week's time, no machine in the world has come up with the same answer – unfortunately, it still means nothing. But, it will be very interesting to hear explanations. Because unfortunately if I heard correctly, even the Deep Blue team made some contradictory statements at the time, about what machine saw or didn't see.

But again, it's a computer, it's well beyond our understanding. It has a very different mind. It can come up with one decision and then



change it, come up with another decision.

So it will mean absolutely nothing. But I can have my own opinion, and I was surprised very much, and this game had profound consequences and an affect on my psychology.

**Reporter:** Could you talk about the human spirit a bit? A lot of people are seeing man, the greatest chess mind in the world, beaten by a machine. Does that somehow diminish the human spirit?

**Kasparov:** I don't think so. This was a very competitive match for one side. And I was not ready to see what was happening in this match starting from game two. I made mistakes in preparation. I mean probably it was difficult to prepare normally for an opponent with no games, with no ideas.

And, what's most important, is that the opponent was constantly changing. I think it's also another great achievement that the Deep Blue team was able to change priorities during the match. I'm really amazed to see that you just change such a fundamental thing as bishop vs. knight and suddenly it becomes equal in game five. Yeah, it becomes equal, because otherwise it doesn't take on f3, you know, in game 5. But again I have no idea what's happening behind the curtain with Deep Blue. Maybe it is absolutely an outstanding scientific accomplishment. Maybe, but I know a little bit about chess and a little bit about chess computers, and I don't think this machine is unbeatable. I think the machine has too many weaknesses, and in competitive chess, in real competitive chess, when we play a match, it will be a different story.

**Reporter:** Talk about your heart. What's going on inside your heart?

**Kasparov:** I said, I am ashamed. I am ashamed that I couldn't prepare myself properly for such an event. But again I would like to look at the results of the match in two or three week's time when we can analyse the games, when we can look at the printouts. I want to understand how Deep Blue won this match. Unfortunately you cannot do it before you look at what was produced by Deep Blue's mind during its hours and hours of calculation.

**Reporter:** Will you publish the algorithms and other technical information on how Deep Blue works? Detailed technical information.

**Tan:** Eventually, we certainly shall be publishing our technical work in technical journals and conferences and so forth.

**Reporter:** You say that now it's time for Deep Blue to come out

and play regular tournament games. Are you willing to allow the computer to enter regular grandmaster tournaments?

*Kasparov:* I don't think that Deep Blue is too weak to participate in regular tournaments. I believe that for the Deep Blue team now, if they are so confident, it's time just to claim the world championship. They can hire three or four players in the world that could join Deep Blue and play a candidates tournament and then, if they want to skip it and go straight to play me a normal match in competitive chess, under conditions that will be imposed by independent sponsor, I'm willing. I'm willing to play this machine in a real event, because I'm not here to doubt the integrity of the machine which was at least twice as strong as in Philadelphia.

*Reporter:* When Deep Blue took ten minutes to make a move, was there any help from any of the programmers, was there any assistance from any of the programmers, were there any suggestions from any of the programmers when Deep Blue took longer than, shall we say, three minutes or six minutes or whatever was programmed at the beginning of a particular game? Is there a yes or no to that question?

*Tan:* Once the clock starts - the answer, first of all, is no, N-O. The second thing I would like to emphasise is that, once the clock starts, none of us can interfere with the Deep Blue system itself, and all the rules that were pre-established before this match were overseen by the arbiter Carol Jarecki and the committee run by Monty Newborn. We followed their rules and the printouts of several games, as requested, were given to the arbiter, Carol Jarecki.

*Reporter:* What about the challenge to play competitive chess?

*Tan:* That's a very interesting idea. You understand that so far we have been doing science, we've been in the laboratory constructing computers, and if you want to take us away from that and become a professional chessplayer? ... that's a very interesting thought. We have to think about that.

*Reporter:* Can you comment on what this means to the future of chess, I mean does this change chess, is chess going to be taken over by computers?

*Kasparov:* I don't think it's even close, that chess will be taken over. *You know, there was one man who was a very good player, maybe the best in the world, who cracked under the pressure.* But that's nothing to do with the computer being unbeatable. This machine is vulner-

able and I have no doubt that in proper competitive chess it will be beaten. Now you can say that this is a post-mortem statement that carries no value, but I learned a lot during this match, and I know what you can do with the machine. You have to play on a very, very high level.

*Reporter:* What was the deciding move in today's game?

*Kasparov:* Today's game doesn't even count as a game because probably it has been published before somewhere. When the computer takes on e6 you can resign. I was not in the mood of playing at all, I have to tell you.

*Reporter:* Why?

*Kasparov:* Because I'm a human being and after game two, I had major, major problems of getting back into the match. I proved to be vulnerable. When I see something that is well beyond my understanding, I'm scared, and that was something well beyond my understanding.

*Reporter:* Could you talk about the psychological effects?

*Kasparov:* Yeah, there was plenty of psychological effect. But as long as I could keep the machine under pressure, you know, forget today's game, I mean Deep Blue hasn't won a single game out of the five because again in game two I resigned when I could have forced a draw. Now, if someone has another opinion, stand up and tell me how the position was not a draw.

Game two was resigned in a completely drawing position. Is that a correct statement? (To the Deep Blue team, who were all shrugging and shaking their heads.) Is it a correct statement Mr Benjamin?

*Benjamin:* Game 2?

*Kasparov:* Game 2.

*Benjamin:* The final position was a draw.

*Kasparov:* The final position was drawn. Now, very important. Now it has been recognised that Deep Blue made a bad mistake in a completely winning strategical position.

What I'm saying is that before today's game, Deep Blue couldn't win a game, and I was playing on a very high level. I was proud of my play in game one, game four and game five. This means that the machine is vulnerable, just add more energy, more resilience, and the machine has no chance.

*Reporter:* Mr Kasparov, would you play Deep Blue again and under what conditions?

*Kasparov:* One condition, IBM as player, not a sponsor.

Kasparov replied to a question about his opening choices.

*Kasparov:* No, when you play Deep Blue, you have a choice. Either to play sort of crap, that you don't normally play, I mean just very rare openings, or to play the best lines. But to play the best lines you have to know your opponent. I cannot study every opening. I have to know what my opponent is likely to play, because the depth of my preparation will be different.

Now, if I have to play next time with Deep Blue, there is no doubt there will be an opening duel and I will play proper moves, 1 e4 with White and 1...c5 with Black, there is no doubt about that.

But here I played probably what has been recommended by every computer specialist, you know, you don't start confrontation, and in game one this proved to be a brilliant success. Deep Blue played a couple of moves, I think Patrick Wolff described it as 'Deep Blue was playing as a numbskull'. You know, it was working, but suddenly it stopped working – suddenly Deep Blue found a way just to break the pawn chains and start a confrontation in a very, very convenient situation.

Probably with Deep Blue the normal computer strategy doesn't work.

*Reporter:* What caused you to blunder in the last game? Did you mix up the lines? You should have taken the knight a little earlier than you did.

*Kasparov:* No, when you allow this piece sacrifice you can resign and there are many games played in competitive chess in which this line has happened, but I can hardly explain what I did today because I was not in a fighting mood.

*Newborn:* We'll take one more question from the audience.

*Reporter:* In terms of chess etiquette, it is usual that chess competitors sit down after the game and talk, discuss and evaluate what they did. What is your incentive to keep your evaluation so hidden and why don't you unseal the envelope and show us the evaluations of Deep Blue, all the moves, just lay open your strategy?

*Tan:* Well, analysing the moves is one thing that we usually do, but on several occasions we haven't had the opportunity to do that. But on the other hand, to reveal the inner thinking of Deep Blue is like giving away whatever Garry was thinking and preparing for the game, and we would rather do that after the match than during it.

That's like revealing everything we have programmed inside the computer. It's very difficult to tell the computer just to give me such and such a piece of information, and not everything else. So, after this match there is certain information that's interesting to the public, which we will be publishing in technical journals.

*Kasparov:* C.J., I think you have misunderstood me. I believe that there is rule in the game of chess that when the game is over, we sign scoresheets and the scoresheets are given to the arbiter. Deep Blue's scoresheet is its printouts. I think that with no conditions, all these printouts from game one to game six must be published, somewhere, on the Internet, and anybody who has any interest in chess or in chess computers can study them. This is not our analysis, you, me, Mr Newborn or anybody else's. It is for anybody who has an interest, because it's a great contribution to the game of chess and computer science. I believe it's your obligation to print out everything that Deep Blue has been considering during long hours of calculation.

*Tan:* We will publish this information in an appropriate forum and appropriate manner, because 99.9% of the people will not understand what 101001 means. So to help people understand what it is, and especially the public, we will be glad to do that at the appropriate time.

*Reporter:* Mr Tan, there was another allegation that there were more grandmasters than are sitting in this room involved in the preparation for playing Mr Kasparov in this match. How do you react to this?

*Tan:* When you go into a match, you involve many friends, ask for people's advice and so forth. And we have had Joel Benjamin with us since August last year, and, a month and a half ago, Grandmaster Miguel Illescas came over to help us analyse and test the program, through IBM Spain.

Joel Benjamin, being a grandmaster, has many other friends. Obviously he probably has many other advisors talking to him. And they have their normal corporate confidential nondisclosure agreements, so it's not up to us to talk about it.

*Reporter:* Garry, in retrospect, would you say that you were too nice to IBM in agreeing to not having access to Deep Blue's previous games as they had access to all of your previous games.

*Kasparov:* Unfortunately, I have been playing too well in the last year, and I believe that my biggest mistake was not to demand certain

conditions that would make this contest fair. Now, first, I think there must be some games available. This is number one.

Number two, I think in future matches, we will consider more openness of Deep Blue even during the match. And I have to confess that the biggest mistake was that I followed the advice of computer specialists who all recommended playing this way. I think this is the biggest mistake. And I said, if I have to play again, guys, you know, we'll play normal openings. There is no doubt about that.

But in order to play normal openings with Deep Blue, with a machine that has unlimited memory, a great team of grandmasters, we don't know how many, I have to start preparing as for a world championship match. I have to take it as competitive chess. I did not. I played a friendly match. I was sure I would win because I knew that the computer would make certain mistakes. And I was correct in game one. But suddenly it stopped making those kind of mistakes any longer, maybe a little bit in the beginning of game three. But my strategy failed. And maybe if I was in a better mood today, I would have survived but, after yesterday's game, which was very tough, I lost my competitive spirit.

... To beat this machine you have to play proper chess. It's clear. Whatever happened in game two or game five, even to beat the machine in game one, it takes a lot. It's a proper opponent, and I have to mobilise more of my resources to play evenly throughout the match.

Here I had to consider what to play before each game, because I decided intentionally not to go to the main openings, and this was a mistake, because during the match you don't have enough time to come up with something that you play regularly, because obviously these guys are studying it very deeply. To study those openings probably takes a couple of months of preparation. My preparation was maybe ten days, and that was not enough, not even close.

*Tan:* Seeing some of the annotated lines of Deep Blue before the match is probably okay, but if I give you the whole dump of whatever the computer is thinking, obviously you don't have a match at all. So again, I said we will publish some of that in an appropriate forum. Obviously today everybody is tired and we need to all go home and celebrate.

I've answered several times, as to why Deep Blue's games are not available. For the previous incarnations of Deep Blue, many games are available. Many, many of them are in the books. And if this ver-

sion of Deep Blue took one year to develop, it is a very young system, and I would like to have had many competitions so that we have many games available, so that we could have tuned the parameters as we went along. If we had provided the games in November it would not be the same machine come February. And same thing, if we had provided games that it played in February, it would not be the same games that would be played in May. So since it's a developing system, those games become meaningless while we are doing development work.

**Reporter:** Mr Kasparov, I don't quite understand what you are saying about opening choice. In two games here you played openings which are very often seen in grandmaster chess and these two games you have lost. In the other four games you played sidelines and you were quite successful in those games. Can you explain what happened?

**Kasparov:** I don't think that was what I played – you shouldn't be misled by looking at the first moves of game two or game six. What I played, you couldn't consider it an opening, you know. But also in game two I played something that is a main line, but you play some decent moves, not the manoeuvres that a couple of times happened in the games of chessplayers.

But in game two I believed I could afford certain things. I wanted to test how Deep Blue plays closed positions. I was very surprised to see that Deep Blue didn't take on b5 because normally computers don't keep up the pressure, they start taking an advantage. It didn't. It's a smart machine now. I learned something.

In game four I successfully implemented something. But in game five, I recognised that even if I play some tricky openings the machine reacts very often like a human player. My strategy didn't work. Deep Blue was learning too quickly and it didn't make the mistakes that I would have expected it to make. After 1 e4 there is a very limited choice of dumb openings such as the one I played in game four, and I tried to play something else. I didn't expect this main line, but again, I wouldn't like you to take this game as a serious one because my ability to fight was very much down today.

I think that eventually the machine will prevail, but I don't think that you can take today as the day of doom. As I said, it's just the beginning, and I have no doubt that personally I will be able to beat the machine even if it has a new version in a year's time. But obvi-

ously it's a historical achievement that the machine was even able to play on such a level with the world champion.

*Reporter:* If you had two months to prepare for this match?

*Kasparov:* A world championship match is a world championship match. Now if I have to take it as serious as a world championship match, as defending my title, preparing properly for an opponent that I can identify, I would play it very, very differently. I will play differently, and again, if you want to check how confident I am, I can bet the entire prize fund of the next match, whatever it is, that I will beat the machine.

*Reporter:* How many games would you like to see involved?

*Kasparov:* I think eight or ten games, a normal match.

*Reporter:* That short a match?

*Kasparov:* Yeah, because then advantages of machine are growing because, you know, I will be tired. I think we should play every second day. You should give a human being time to rest. You know, 20 days, ten games, a proper match and I'm really taking the challenge and I believe that some other players would like to participate as well. Again, I don't think you have to compete against many players, Mr C.J., I think there are very few that are capable of fighting Deep Blue, but I think it's time to prove that the machine can do a little bit better than this match.

*Reporter:* Garry, what are the implications of this on the ELO system?

*Kasparov:* This match has no rating implications. If you ask me to give a rating to Deep Blue, I think it's almost impossible because you have to evaluate something that makes different moves. If you look at the beginning of game one or game three, you will be flattered even to give any rating to this machine. Now, if you look at the end of game five or game four you will give it say 2800, or maybe higher. Now I still think it's very difficult to make any rating evaluations today without the machine playing proper competitive chess.

It obviously plays many positions at the level of 2800 or above. But there are still many weaknesses, and probably the average will be somewhere around 2800 today.

*Newborn:* I'd like to close this press conference by thanking all those who have participated. I hope to see everybody on this stage next year.



## The Day After

Some segments of the press had a field day with Deep Blue's victory. A cartoon in the *New York Post* showed a smashed-up TV studio with chess pieces thrown around the floor and a chair hurled into Deep Blue's monitor. Two bow-tied men, wearing headphones and mikes, are sitting like boxing announcers. 'I'd like to see a computer do that,' says one. There were all kinds of lines about unplugging computers and machines being superior to men. 'Politically Incorrect' host Bill Maher even told a joke about Kasparov coming back to his hotel after the match and finding his wife had left him for, shall we say, a mechanical sex aid. And Monday's *Boston Herald* ran a huge headline across its front page screaming 'You Lose, Man.'

That day IBM's stock rose to a 52-week high and the company's chairman sent out the following internal memo to his employees.

From: L. V. Gerstner, Jr.; Subject: Deep Blue

Dear Colleague,

I know I speak for IBM colleagues everywhere in congratulating the Deep Blue team on its outstanding performance. It was the culmination of years of research and exploration, and it will stand as a great example of IBM's technology leadership. As much as I love to win (and I'm glad we did), I don't think the triumph of the match was that Deep Blue won and Garry Kasparov lost. The achievement was in demonstrating that powerful computers like Deep Blue can successfully tackle tough problems that require mind-bending high-speed analysis. Now we can apply what we've learned to help improve medical research, air traffic management, financial market analysis and many other fields our customers care about.

I also want to thank Garry Kasparov. There aren't many people in the world who would have been willing to match their intelligence and wits against an opponent like Deep Blue — and under intense media scrutiny. Mr Kasparov never considered this match a side-show. He took it seriously, and his sincerity as our partner in this experiment made it the invaluable learning experience it was.

Lou

That same day, the Deep Blue team handed over 441 pages of documents to Kasparov's team. The much discussed 'printouts' included a detailed analysis of how the computer had rejected 36 ♖b6 in game two. As explained by a graphic in Tuesday's *New York Times*, the printout revealed how Deep Blue, searching eight moves ahead, evaluated that 36 ♖b6 would net it an advantage equivalent to 0.87 pawns. But the same move yielded only a 0.48 pawn advantage when the computer looked 11 moves ahead. So Deep Blue began testing a new idea, and eventually decided that 36 axb5 was superior. According to this record, 36 axb5 was the result of an unusual, but not miraculous, decision-making process. But Freidel said the log did not include all the information they needed to reach a conclusion.

By Thursday, Kasparov appeared to be recovering both his composure and his public relations skills. 'I do not blame IBM, I blame myself,' he told CNN's Larry King. 'If I'm angry it is only with myself because obviously I made some bad mistakes and lost this match, but some of these mistakes were predestined ... because I was preparing to play a completely different opponent.'

Once again, the world champion reiterated that he never really recovered after game two. 'It was always sitting in the back of my head: I'm playing somebody or something or whatever and I don't understand the nature or strengths of this opponent,' he said. 'This machine sees as deep or deeper than I do.'

A calm and unflappable Kasparov challenged IBM to a winner-take-all third match with Deep Blue. Wearing his familiar sponsor-smile, the world champion gave October or November as possible dates. He recommended that the match be 10 games long and stretch over three weeks with play every other day. 'I would like to change certain conditions to make it more adjustable for a human player,' he said, adding that as a pre-match condition, he would insist on seeing 10 recent games played by the computer. Kasparov still held the belief that some members of the Deep Blue team had gone beyond science and personalised the struggle. 'If we play next time I will take it as a very competitive challenge,' he said.

The appearance was a well-timed effort to put the weekend's events behind him. The ball was now in IBM's court. If you were Lou Gerstner, what would you do?

# **Dream Team, Dream Machine: Why Deep Blue Won**

## **Deep Blue Had Better Technology**

The greatest achievement of the team that prepared Deep Blue for its 1997 match was the considerable progress they made in strengthening its evaluation function. Joel Benjamin's often mentioned 'chess school' helped make Deep Blue's play stronger and more sophisticated. A series of training games against various grandmasters also helped the team identify and eliminate specific weaknesses in the program. And with the machine twice as fast as in 1996, it could probe further and deeper in its games. Without these improvements, it is unlikely that the computer would have made it to game six with the match tied.

## **It Played Like a Human**

Deep Blue's second game against the world champion is now widely regarded to be the best game ever played by a computer and led Kasparov to conclude that some of its moves appeared to be 'almost human'. The machine didn't just crush Kasparov in their Ruy Lopez encounter. Twice in the match Deep Blue made the very un-computer-like decision to reject direct material gain. Its choice of two extremely subtle and far more lethal continuations came at key moments in games two and six – the two games the computer won.

### **It Played Like a Computer**

Of course, there were a handful of moves from Deep Blue that seemed to be simply anti-positional or just plain hard to fathom. But the computer's natural advantages left the world champion in the extremely unfamiliar situation of facing an opponent superior in both memory and calculation. A desire to reach closed, manoeuvring games may have led directly to Kasparov's disastrous opening experiment in game two. Equally important was Deep Blue's relentless and frustrating defence of inferior positions in games three and four and its fearless and brilliantly tactical solution to draw game five.

### **The Deep Blue Team Had Better Psychology**

Impressive as they are, the above factors would probably not have been enough – on their own – to actually topple the world champion. At least this time. But it seems that in 1997 some Deep Blue team members introduced a new weapon into the battle. It was yet another example of turning one of Kasparov's greatest strengths – psychology – against himself. Miguel Illescas told the *New York Times* in increasingly strong interviews during games three and four that Kasparov was 'afraid' of Deep Blue. Benjamin also made some digs at Kasparov's expense in post-game comments. It's hard to know if these acts were orchestrated by the IBM team, or were just the opinions of a couple of grandmasters enjoying the unusual situation of being able to intimidate the world champion. They certainly got under Kasparov's skin. By the post game five briefing, the world champion's usual confidence was nowhere to be found.

# The Human Dimension: Why Garry Kasparov Lost

## He Put the Machine on a Pedestal

The seeds of Kasparov's defeat in New York were probably first planted 15 months earlier in Philadelphia when he exclaimed that in certain situations Deep Blue 'plays like God'. During the 1997 match, Kasparov's frustration in facing an opponent who could 'outcalculate' him became increasingly evident. After game two, the world champion seemed to lose his ability to judge the computer's strengths and weaknesses in a balanced way. Instead of citing Deep Blue's failure to foresee the perpetual check as a sign of its fallibility, Kasparov preferred a mystical explanation. In his public comments, he returned again and again to Deep Blue's famous bishop blocking manoeuvre at move 37, and said he was having difficulty playing something he couldn't understand. Kasparov didn't seem to be considering the possibility, mentioned by one of the programmers to the audience, that a machine with the complexity of Deep Blue would always have a few bugs in its system. Kasparov's deference to the machine was clearly reaching dangerous levels when he gave comments on his Club Kasparov website that praised the b2-b4-b5 pawn thrust in game four. He probably should have dismissed it as a weakening move, as he did of its mirror, the faulty ...g7-g5-g4 manoeuvre of game one.

### **He Didn't Keep His Eye on the Ball**

During the match Kasparov was arranging commercial side deals on clocks and websites, getting hung up on Illescas' quotes in the *New York Times*, and obsessing over the 'printouts'. It is quite likely that these and probably other events simply served to distract Kasparov from the real business at hand: winning the match. Instead of talking about Maradona putting his hand on the ball, he should have concentrated on keeping his own eye on the ball – or, in this case, the board. Before he let everything get to him, Kasparov was well aware of this: At the opening news conference, he said the result would hang on his ability to keep his concentration.

### **Kasparov Got Psyched Out**

Kasparov's confident and convincing victory in game one makes it all the more difficult to comprehend – even with the double whammy of game two – how he could lose control of his equilibrium and collapse so badly at the end of the contest. Perhaps the world champion was out of form. Perhaps the choice of 'anti-computer' openings and his 'New Kasparov' ultra-positional style took their toll. On the other hand, Kasparov scored well in the four games where he opened so unusually. Indeed, it was in these games that he scored all his points.

What is clear though, is that in conjunction with the reasons given above Garry's difficulty in facing an opponent he could not psyche out – an opponent who has no conception of fear itself, weakened the world champion to breaking point. Kasparov has always been driven, like Fischer, to crush his opponent's ego. As Patrick Wolff observed, when confronted by an opponent with no ego to battle, Kasparov 'turned on himself'.

In the larger context, however, we must not forget that Kasparov remains not only the world champion, but also the highest ranked player in history. Although he is likely to remain so through the millennium, this was his first loss in a match, and future opponents are likely to see him as just a little more vulnerable than before. As *Wall Street Journal* columnist Roger Lowenstein said: 'Before this match, Kasparov played like a machine. Deep Blue made him human.'

# Brave New Chess World

So Garry Kasparov has lost to Deep Blue, becoming the first human world chess champion to lose to a computer in a full contest, and just possibly, even the last world champion to be human at all. With Kasparov most unlikely to scuttle off into the wastelands of history, the question remains whether Deep Blue's victory will usher in a new dawn of global fascination with chess and mind sports in general.

One obvious spin-off, much to IBM's advantage, would be to create a version of the Deep Blue program for use on personal computers, and launch it on the world market. With IBM having generated several hundred million dollars worth of publicity from the match, the company is uniquely placed to reap a rich commercial harvest from the intellectual capital they have so successfully and spectacularly nurtured with their Deep Blue project.

A further boon, to both the advancement of science and the international chess community, would be for IBM to actively enter Deep Blue into competitions against other elite grandmasters, such as Anand, Karpov, Kramnik, Ivanchuk, Short and Polgar. If world chess organisers are reluctant to invite the computer, or if IBM itself is shy of taking on further challenges, then chess players and enthusiasts should lobby both FIDE and IBM.

Of course, one infallible way of determining whether Deep Blue is now, in fact, the world's strongest chess player, or whether the sensational outcome of the match was mainly caused by Kasparov's poor

psychological preparation (Anand, for example, in the German magazine *Der Spiegel* accused Kasparov of treating the machine 'like God'), would be for Kasparov to challenge Deep Blue to a 20-game match with nothing less than his world title at stake. This would be a gauntlet that IBM dare not leave lying without exposing themselves to charges of cowardice. It would be tragic if Deep Blue were to repeat the behaviour of the last 'American player' who won a match against the world champion: After 1972, Bobby Fischer did not play in public for 20 years.

Deep Blue has won, but the suspicion remains that this was really because Kasparov lost. However, can it be said that Deep Blue has contributed anything new to our understanding of chess? In fact, it has injected a new element of discontinuity into chess strategy. The traditional 'well-made' game of chess follows a clear line: superior strategy nets an advantage in position, which permits the stronger side to finish off with a fine display of tactical pyrotechnics. Kasparov himself has won innumerable games of this type.

But Deep Blue has eroded these certainties. The machine's tactical arsenal of defensive wizardry in precarious situations has virtually enabled it to chop up the game into disparate sequences, where defeat is continually postponed by virtue of the machine's calculating excellence. This inability to impose a pattern to dictate a pleasing strategic flow was partly the function of some infelicitous opening choices by Kasparov, but also of Deep Blue's ability to keep bad positions in a state of flux. Assuredly, Kasparov's frustration at his inability to land a direct hit in Games 3, 4 and 5 must have contributed massively to his psychic collapse in Game 6.

In 1992, co-author Keene was one of the organisers of the first ever World Championship in any type of event between a man and a machine. This was the Checkers (Draughts) World Championship between the Chinook program, running on a Silicon Graphics computer, and the dominant figure in world checkers, U.S. champion Dr. Marion Tinsley. Tinsley won the match, so all was well, but withdrew from a replay held two years later in Boston. Even though the score was equal at that time, the rules in force dictated that Chinook be declared the new world champion.

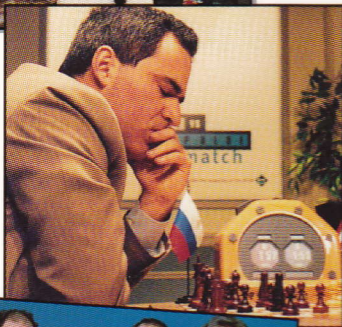
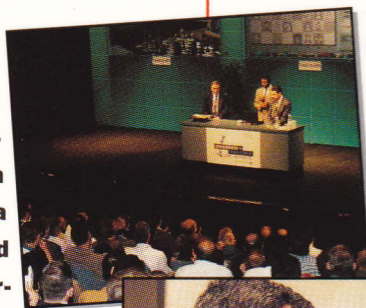
What was the reaction of the world checkers community to this novel and unexpected situation? It was lamentable. The best human was declared 'World Champion' by the authorities and governing



bodies, while Chinook's title was demoted to that of 'Man-Machine World Champion.' This sad state of affairs, where the world's best player, whether silicon- or carbon-based, has been sidelined, must never be allowed to exist in chess. If Deep Blue really is, or becomes, the best player, then we must accept all of its challenges, and it must accept the best of ours. If not, chess knowledge, and indeed truth, will atrophy.

Finally, amidst all this talk of 'man versus machine' we must remember at all times that Deep Blue's victory is also a triumph for the human brain. Deep Blue does not come from a machine planet - it is the product of scientists and grandmasters. These individuals may not be equal over the chessboard to the Colossus they have toppled, but their collective intellectual achievement will go down in the record books of superlative human firsts.

In May 1997 world chess champion Garry Kasparov, regarded by many as the greatest player of all time, came to New York to face his most unusual and challenging opponent yet. Deep Blue, a supercomputer developed by a team of IBM scientists in a project started over ten years earlier, was capable of calculating 200 million chess positions in a single second and was incapable of tiring, losing heart or making an oversight. Six games would be played for over \$1 million in prize money. This book tells the full story of this historic encounter, from the personalities, hype, and controversies to the debates over computer intelligence and the future of chess. Every game is analyzed in detail and the earlier 1989 and 1996 matches between the two contestants are reviewed. Man versus Machine: Kasparov versus Deep Blue is the definitive on-the-scene report that every chess enthusiast must read.



"The brain's last stand." *NEWSWEEK*

"A victory by Deep Blue would be a very important and frightening milestone in the history of mankind." *GARRY KASPAROV*

"I just think we should look at this as a chess match between the world's greatest chess player and Garry Kasparov."

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CHESS COLUMNIST AND FIVE-  
TIME US CHAMPION*

International Master David Goodman of New York spent six years reporting on Garry Kasparov for a wide range of publications, including *Time* and *Chess Life*, and is the author of several books on world championship matches.

International Grandmaster Raymond Keene of London is the chess correspondent for *The Times*, *The Sunday Times* and *The Spectator* and is the author of over 100 books on chess, including several coauthored with Garry Kasparov.

**\$17.95**

ISBN 1-888281-06-5



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