



THE 21st ACM NORTH AMERICAN Computer Chess Championship

*New York, New York
November 11-14, 1990*

**Monty Newborn, McGill University
Danny Kopec, University of Maine**



After twenty years of traveling from city to city across the United States, the ACM North American Computer Chess Championship came back to the place of its birth, the New York Hilton Hotel, where the competitions began in 1970. This latest five-round event ended in a two-way tie for first place between MEPHISTO and DEEP THOUGHT/88. Finishing in a two-way tie for third place were HITECH and M CHESSE. A total of 10 teams participated, and the level of play was at the low grandmaster level. A special three-round endgame championship was won by MEPHISTO, who also captured the prize for the best Small Computing System. A total of \$8000 in prizes was divided up among the winners.

DEEP THOUGHT/88, currently under development at IBM by researchers Feng-Hsiung Hsu, Murray Campbell, and Thomas Anantharaman along with two former associates at Carnegie Mellon University, Peter Jensen and Andreas Nowatzky, outplayed MEPHISTO in the third round but lost to HITECH in the next round. It entered the final round of play one-half point behind HITECH, who had won all of its games with the exception of a first-round draw with ZARKOV. DEEP THOUGHT/88 defeated ZARKOV in the final round while HITECH lost on time to MEPHISTO in a dead-drawn game.

MEPHISTO won all of its games with the exception of its third-round loss to DEEP THOUGHT/88.

MEPHISTO played solid chess throughout the event, but was fortunate to win its game against HITECH in the final round. MEPHISTO, developed by Richard Lang of Great Britain, is marketed by the German company of Hegener & Glaser A.G. The rules of the tournament required each side to play all of its moves within a two-hour period ensuring that the games would last at most four hours. MEPHISTO played slightly faster than HITECH in the middle game and entered the endgame with approximately five more minutes on its clock. HITECH, who played even with MEPHISTO, was unable to regain the lost time and eventually lost a dead-drawn game on move 145.

The tournament was marred by difficulties. This was the first time the tournament was played during the day, and Bob Hyatt was unable to make the necessary arrangements. DEEP THOUGHT/88 was used by Hsu and company when they found they did not have sufficient time to test out their latest version. ZERKER, a new entry developed by James Testa at the University of California, Berkeley, was forced to withdraw because its SUN computer was damaged on shipping. CRAY BLITZ, a former world champion, had to pass up the event because it was unable to gain access to a CRAY computer.

Ken Thompson's BELLE rejoined the competition after an absence of several years, but was unable to do better than seventh place. BELLE was the world champion program from 1980 to 1983, and was the first program awarded the title of Master by the United States Chess Federation. This title was formally awarded to BELLE in 1983 at the Fourth World Computer Chess Championship by the USCF on the very evening when it was dethroned by NUCHESS in its bid to repeat as world champion. Thompson has made some improvements to BELLE in recent years, but its seventh-place finish shows just how much stronger the programs are today than

ILLUSTRATION: DENNIS AHLGRIM





they were when BELLE was best.

Mike Valvo served as Tournament Director after a one year leave. He will return again as TD when the next championship takes place in Albuquerque, New Mexico on November 17-20, 1991 at Supercomputing '91. For further information on this upcoming event, write to Professor Monty Newborn, Department of Computer Science, McGill University, Montreal, Quebec, CANADA H3A 2A7.

THE MAIN CHAMPIONSHIP



he championship was highlighted by three "heavyweights" in the current world of computer chess: DEEP THOUGHT/88, HITECH, and MEPHISTO. DEEP THOUGHT/88, the reigning World Champion and defending ACM Co-champion, was the favorite with ACM Co-champion HITECH and MEPHISTO, World Micro-computer Champion, closely behind.

The first surprise of the tournament was in Round 1 when ZARKOV drew with HITECH. It was an exceptional case in point where too much opening preparation may have led directly to a program's difficulties. HITECH entered the fourth round with 2.5/3 trailing DEEP THOUGHT/88 3/3 by a half a point. After four rounds it seemed that rating probabilities had finally caught up in HITECH's favor. In its previous three head-to-head tournament encounters with DEEP THOUGHT/88, HITECH had lost (Sixth World Computer Chess Championship in Edmonton, 1989, 19th ACM North American Computer Chess Championship in Orlando, 1988, and 20th ACM North American Computer Chess Championship in Reno, 1989) with a rating difference of about 150 points (DEEP THOUGHT 2551, HITECH, 2413). HITECH would be expected to score in approximately one in four games.

When HITECH won its fourth-round game against DEEP THOUGHT/88, taking over sole possession of first place, the stage was set for the final round MEPHISTO-

HITECH showdown. The only legitimate result for this game was a draw. However, due to the relative unfamiliarity of the participants, tournament director, and organizers coupled with the sudden death time control (all moves in 2 hours), the game ended bizarrely. During a meeting of the participants and organizers held just before the tournament began, Hans Berliner, the programmer of HITECH, voted in favor of games being played to the end (until a checkmate, draw, or time forfeit occurs) without intervention from the tournament director. In human chess tournaments with sudden death time controls the tournament director is expected to intervene when it is clear that either side's only hope of winning is on the clock and the chess moves become rather inconsequential.

Thus MEPHISTO finished tied for first with DEEP THOUGHT/88 with 4 points, and HITECH had to settle for a third place tie with M CHESS with 3.5 points.

GAMES FROM THE MAIN EVENT

Round 3, Board 1

White: DEEP THOUGHT/88 vs.
Black: MEPHISTO



n Reno (1989) Mephisto was the first program to ever defeat DEEP THOUGHT/88. Here DEEP THOUGHT/88 and MEPHISTO entered the third round as the only programs with perfect scores and DEEP THOUGHT/88 exacted revenge through straightforward positional pressure.

Here MEPHISTO plays 4 ...Nc6? which quickly lands it in trouble. This error, which incidently DEEP THOUGHT/88 is also prone to, breaks the simple heuristic that in Queen Pawn Openings the Queen Knight should not block the Queen Bishop's Pawn. This error was compounded with 5 ...Bb4+? trading off Black's theoretically better bishop. Without this move, White's Queen's Bishop may become a problem. After 9 ...Na5?! White attained the spatial advantage on the Queenside which was





maintained and exploited throughout the game. DEEP THOUGHT/88's various positional probes on the Queenside led nowhere in particular until they were capped brilliantly with the stroke 32 Nde5+! which led to the gain of a pawn and a winning Knight Ending. DEEP THOUGHT/88 played very logically and consistently by advancing its king to the critical Queenside sector until the decisive breakthrough there became feasible. MEPHISTO's Kingside pawn advances may have eased DEEP THOUGHT/88's task.

1 Nf3 d5 2 e3 Nf6 3 c4 e6 4 Be2 Nc6 5 d4

Bb4+ 6 Bd2 O-O 7 Bxb4 Nxb4 8 a3 Nc6 9 O-O Na5 10 c5 b6 11 b4 Nc6 12 Nc3 bxc5 13 bxc5 Qe7 14 Rb1 Bd7 15 Bb5 Rfb8 16 Qa4 Nd8 17 Bxd7 Nxd7 18 Qa5 Rc8 19 Nb5 a6 20 Nc3 Qf6 21 Rb3 Qg6 22 Rfb1 f6 23 R1b2 h6 24 Kh1 Qd3 25 Ne2 Qd1+ 26 Nfg1 Nc6 27 Qa4 Ndb8 28 Nf4 Kf7 29 Nd3 Rh8 30 Rb1 Qd2 31 Nf3 Qa5 32 Nde5+ fxe5 33 Nxe5+ Kf6 34 Qxa5 Nxa5 35 Rxb8 Rhxb8 36 Rxb8 Rxb8 37 Nd7+ Ke7 38 Nxb8 Nc4 39 Nxa6 Kd8 40 a4 Nb2 41 Kg1 Nxa4 42 Kf1 Kd7 43 f3 Nc3 44 Nb8+ Kc8 45 Nc6 Kd7 46 Ne5+ Ke7 47 Ke1 g5 48 Kd2 Nb5 49 Kc2 Kf6 50 Kb3 Na7 51 Kb4 h5 52 Ka5 Nc8 53 g4 hxg4 54 fxg4

COMPUTING SYSTEM INFORMATION 21st ACM NACCC

Program, Authors	Computing system, language, etc. (*indicates computer at site)	Book size	Nodes/ sec.	Rating estimate
BEBE Tony Scherzer, Linda Scherzer	SYS-10 Chess Engine, assembler, special-purpose chess circuitry, 64Kb, 16 bits, 10 mips, 3Meg hash table*	5K	40K	2150
BELLE Ken Thompson	PDP 11/23, C Special-purpose chess hardware (Bell Laboratories)	400K	150K	2250
DEEP THOUGHT/88 Thomas Anantharaman, Peter Jensen, Murray Campbell, Feng-Hsiung Hsu, Andreas Nowatzky	1 SUN 4 with two special processors, C+microcode, 1 M hash table, (Carnegie Mellon University)	5K	800K	2551
HITECH Carl Ebeling, Hans Berliner, Gordon Goetsch, Andy Gruss	SUN 4 with special chess hardware, microcode + assembler, 1M hash table, (Carnegie Mellon University)	NA	100K	2400
M CHESS Marty Hirsch	80386 microprocessor*	NA	NA	NA
MEPHISTO Richard Lang	68030 Mephisto machine, assembler 128K ROM, 32bit, 45 mh., 1M hash table*	60K	10K	2350 FIDE
NIGHTMARE Reinhold Gellner, Gaby von Rekowski	80386, C + assembler, 250K hash table*	15K (moves)	700	1750
NOW Mark Lefler	80386, Pascal + assembler*	5K (moves)	3K	1950
ZARKOV John Stanbeck	MIPS 6000, C 32 bits, 55 mips, 16K hash table (HP, Fort Collins, Colorado)	5K	2.5K	2200
ZERKER James Testa	Sun Sparkstation, C, 16 Meg, 32 bits, 12 mips, 100Mb hash table, 200,000 transistor VLSI chess microprocessor* (University of California, Berkeley)	9K	7000K (moves)	2300





Ne7 55 Ka6 Ng8 56 Kb7 Ke7 57 Kxc7 Nf6 58 c6 Ne8 59 Kc8 Kd6 60 Kb7 Black resigns.

Round 4, Board 1

White: HITECH vs.

Black: DEEP THOUGHT/88

Hitech's victory in the fourth round against DEEP THOUGHT/88 was a truly magnificent example of fine positional play converted to an explosive tactical finish.

1 e4 c5 2 Nf3 Nc6 3 Bb5

The Rossolimo Variation against the Sicilian Defense avoids most popular and complex lines of the Sicilian.

3 ...g6 4 O-O Bg7 5 c3 Nf6 6 Re1 O-O 7 d4 cxd4 8 cxd4 d5 9 e5 Ne4 10 Nc3 Nxc3 11 bxc3 Bg4

This is all considered "book" to this point and no doubt these moves were part of both program's Opening libraries. White has a big center but Black has two bishops and sufficient chances for counterplay.

12 h3 Bf5

This seems a quite playable idea, namely to retain the two bishops and to make it difficult for White to challenge the b-file in the

event of the likely Bxc6, bxc6. etc. Normal is 12 ...Bxf3 13 Qxf3 Qa5! when 14 Qxd5 or 14 Qd3 can both be met strongly by Nxd4.

13 Bxc6 bxc6 14 Ba3 Rb8 15 Bc5

White's bishop is annoying because it has a target (P/e7) and cannot be contested. The Black plan ...e6, ...Bf8 is virtually impossible to organize with impunity.

15 ...Qc7 16 Qc1 Rb7 17 Nh4!

HITECH does very well to recognize that the only way to utilize its Kingside space advantage is by the pawn storm f4-f5.

17 ...Be4 18 Qe3 Rfb8 19 f3 Bc2 20 Rec1 Ba4?

It is imperative that Black obtain some relief through the simplifications which follow from 20 ...Rb1. Now this bishop becomes a mere spectator.

21 f4 Bb5 22 f5!

White's attack has gained full steam.

22 ...Kh8 23 e6!

Black's K-side is demolished!

23 ...Bf6 24 exf7 Kg7

Now if 24 ...Bxh4 25 Qh6 Qd8 (to stop f8 = Q+ and mate follows) 26 fxf6 wins.

SCORECARD FOR THE 21st ACM NACCC

#	Program	Round 1	Round 2	Round 3	Round 4	Round 5	Total Points	Place
1	DEEP THOUGHTS	6W 1	7B 2	2W 3	3B 3	5W 4	4	1
2	MEPHISTO	9W 1	4B 2	1B 2	5W 3	3W 4	4	1
3	HITECH	5B ½	8W 1½	7B 2½	1W 3½	2B 3½	3½	3
4	M CHESS	10B 12W	1 8B	2 7W	36B 3½	3½	3	
5	ZARKOV	3W ½	9B 1½	6W 2½	3B 2½	1B 2½	2½	5
6	BEBE	1B 0	10W 1	5B 1	9W 2	4W 2½	2½	5
7	BELLE	8B 1	1W 1	3W 1	4B 1	Bye 2	2	7
8	NIGHTMARE	4W 0	3B 0	4W 0	Bye 1	9B 2	2	7
9	NOW	2B 0	5W 0	Bye 1	6B 1	8W 1	1	9
10	ZERKER	4W 0	6B 0	Withdrew			0	10

Note: Each entry in the "Round" column denotes the opponent, the color played, and the cumulative points earned.





25 Nf3 gxf5 26 Re1

26 Ng5! forcing Bxg5 27 Qxg5+ Kxf7 28 Qxf5+ also looked very attractive.

26 ...Kxf7 27 Qh6

A most natural attacking move which also offers excellent prospects in an ending after the h-pawn goes if White's attack does not prove decisive. However 27 Ng5+ also deserved great scrutiny, e.g. 27 ...Bxg5 28 Qxg5 e6 29 Rxe6! Kxe6 30 Re1+ Kf7 (or 30 ...Be2!? 31 Rxe2+ Kf7 32 Re5 Rb1+ 33 Kf2 R8b2+ 34 Kf3 etc.) 31 Re5, but 31 ...Bd3 seems to refute White's attack. Then on 32 Re7+ Qxe7 33 Bxe7 Rxe7 Black has more than enough for the queen.

27 ...Qg3

The best chance.

28 Qxh7+ Ke8 29 Qxf5 Qg7 30 Re6 Bc4 31 Rxc6

At this point there are a number of decisive ways for White to proceed including 31 Rae1 or 31 Ne5. This second extra pawn is like tax-free money in the bank! Momentarily one thinks that HITECH does not have a "tactical eye" for a flashy finish, but ...

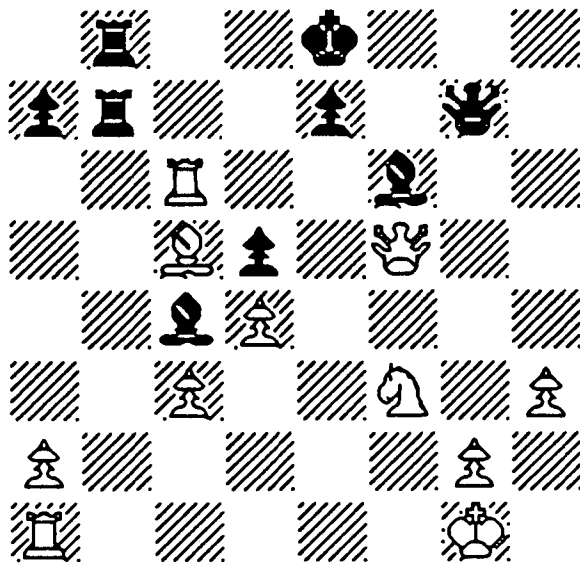


FIGURE 1
Position after 30 Rxc6

31 ...Kd8 32 Bd6!

On 32 ...exd6 34 Rxd6+ Rd7 35 Rxf6 wins easily. This move followed by White's next ...

32 ...Bb5 33 Ne5!!

...shows that HITECH has plenty of punch. If 33 ...Bxc6 34 Nxc6+ and 35 Nxb8 wins a whole piece. Or on 33 ...exd6 34 Rxd6+ Bd7 36 Nxd7 Bxd4+ 36 cxd4 Qxd4+ 37 Kh2 Qxa1 38 Nb8+ Kc7 39 Qd7+ Kxb8 40 Qd8 mate.

33 ...Bxe5 34 Bxe5 Qxe5

This was Black's best chance for longest survival. However, the rest of the game is of little interest as White has a decisive material edge.

35 Qxe5 Bxc6 36 Qe6 Rb1+ 37 Rxb1 Rxb1+ 38 Kh2 Rb6 39 g4 Bb7 40 Qg8+ Kc7 41 Qf7 Bc6 42 Qxe7+ Bd7 43 Qc5+ Rc6 44 Qxd5 Re6 45 Kg3 Re1 46 c4 Re2 47 Qa5+ Kb7 48 Qb4+ Kc8 49 Qa3 Kb8 50 d5 Re4 51 c5 Bxg4 Black resigns.

There are few humans who would not be proud of producing a game like this.

Round 5, Board 1

White: MEPHISTO vs. Black: HITECH

The Opening in MEPHISTO versus HITECH is undeniably to White's advantage, but it is hard to prove anything without opening the position up and entering some tactics, which is not MEPHISTO's wont. Instead, HITECH takes some action with 21 ...f5. The game looks like it might end in a quick draw after the ending is briskly reached from the sequence following 23 ...f4 24. Rxb6 fxd3 25 Rf6 etc. All the rooks might have even come off with 30 ...Rf8. Instead we have one of the longest drawn out affairs in ACM Championship history. Neither side deserved to win or lose this game. Had HITECH lasted a few more moves there may not even have been sufficient material left to mate.

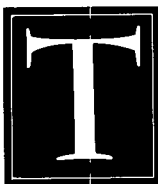
1 d4 Nf6 2 c4 g6 3 Nc3 d5 4 Nf3 Bg7 5 cxd5 Nxd5 6 Bd2 O-O 7 Rc1 Nc6 8 e4 Nxc3 9 bxc3 Qd6 10 Be2 e5 11 d5 Nb8 12 c4 Nd7 13 O-O Nc5 14 Bb4 Qb6 15 Rb1 Re8 16 Qc2 h6 17 Rfc1 a6 18 h3 Rb8 19 Nd2 Bd7 20 Qc3 Bf8 21 Qe3 f5 22 Qg3 Kh7 23 Bc3 f4 24 Rxb6 fxd3 25 Rf6 Be7 26 Rf3 gxf2+ 27 Rxf2 Bg5 28 Rf3 Kg8 29 Bb4 b6 30 Rcf1 Bxd2 31 Bxd2 g5 32 Re3 Rf8





33 Rxf8+ Kxf8 34 Bc3 Re8 35 Bb4 Ra8 36 Bc5 bxc5 37 Rb3 Ke7 38 Kf2 a5 39 Ke3 Kd6 40 Rb7 Be8 41 Bg4 h5 42 Bf5 h4 43 a3 Bh5 44 Kd3 Bf7 45 Kd2 Be8 46 Ke2 a4 47 Kf3 Bh5+ 48 Kf2 Bf7 49 g3 hxg3+ 50 Kxg3 Bh5 51 Kf2 Bd1 52 Ke3 Bh5 53 Rb1 Rf8 54 Rb5 Ra8 55 Rb7 Bf7 56 Kd2 Bh5 57 Kd3 Be8 58 Rb1 Bh5 59 Rb2 Rd8 60 Rb7 Ra8 61 Kd2 Bf7 62 Ke1 Ra6 63 Rb8 Ke7 64 Kf2 Rb6 65 Rxb6 cxb6 66 Kg3 Bh5 67 Bg4 Be8 68 Be2 Bg6 69 Bd3 Bh5 70 h4 gxh4+ 71 Kxh4 Be8 72 Kg4 Bd7+ 73 Kg5 Bh3 74 Kh4 Bc8 75 Bf1 Kf6 76 Kg3 Ke7 77 Kf3 Kd7 78 Be2 Kd6 79 Ke3 Ke7 80 Kd2 Bh3 81 Kc3 Bc8 82 Bd1 Bd7 83 Bc2 Kd6 84 Bd3 Be8 85 Be2 Bg6 86 Kd3 Be8 87 Kd2 Bg6 88 Bf3 Ke7 89 Bg2 Bh5 90 Ke3 Be8 91 Bf1 Kd7 92 Be2 Kd6 93 Kd3 Kd7 94 Kc3 Kd6 95 Bd3 Kd7 96 Kd2 Kd6 97 Bf1 Bg6 98 Ke3 Bh5 99 Bd3 Be8 100 Kf2 Bh5 101 Kg3 Bd1 102 Kg2 Bg4 103 Kf1 Bh5 104 Kf2 Be8 105 Kg3 Bd7 106 Be2 Ke7 107 Kh4 Bc8 108 Bd3 Kd6 109 Bf1 Ke7 110 Kg5 Kd6 111 Kf6 Bg4 112 Bd3 Bd7 113 Be2 Bh3 114 Kg5 Ke7 115 Kg6 Bg2 116 Kf5 Kd6 117 Bd3 Bh3+ 118 Kg5 Bd7 119 Bc2 b5 120 cxb5 Bxb5 121 Kg4 c4 122 Kf3 Bd7 123 Ke3 Kc5 124 Bd1 Be8 125 Bg5 Kd6 126 Kd2 Bg6 127 Bf3 Kc5 128 Kc3 Bh7 129 d6 Kxd6 130 Kxc4 Bg8+ 131 Kb5 Bb3 132 Bh5 Bc2 133 Bf3 Ke6 134 Kc5 Bd3 135 Bg2 Kf6 136 Kd6 Be6 137 Bf1 Bf7 138 Bb5 Bb3 139 Be8 Bc2 140 Bc6 Bd1 141 Kd5 Bb3+ 142 Kc5 Bd1 143 Kb4 Bc2 144 Bxa4 Bxe4 145 Bb5 Black loses on time.

THE ENDGAME CHAMPIONSHIP



he special Endgame Championship directed by Danny Kopec had four participants: MEPHISTO, M CHESS, ZARKOV and NOW. For many years there has been a general consensus among those observing computer chess progress that endgame play was rather weak. This special event was put together in an effort to shed some light on this issue. Time only permitted three rounds. Each round consisted of two games

with each side taking turns as Black and White. A total of twenty minutes per game was given to each participant.

The three positions were selected based on involving play from well-known, documented, and top grandmaster competition. All three positions were theoretically drawn according to published sources. Therefore the expected score for each program in the tournament (with correct play by both sides) was 3/6 (six draws). However, even from this small sample it was possible to confirm that there are great differences among the programs' endgame abilities, which correspond to their overall rating differences. The participants were MEPHISTO, M CHESS, ZARKOV, and NOW.

ROUND 1: The test position in Round 1 was from Game 1 of Fischer-Spassky, Reykjavik, 1972. Fischer played ...Bxh2 around move 30 in this dead even Bishop Ending and lost. Much subsequent analysis by many people indicated that with very accurate play Fischer might still have been able to salvage a draw.

MEPHISTO is the only program which does not bite on h2. MEPHISTO wins from both sides of this position as does M CHESS against NOW.

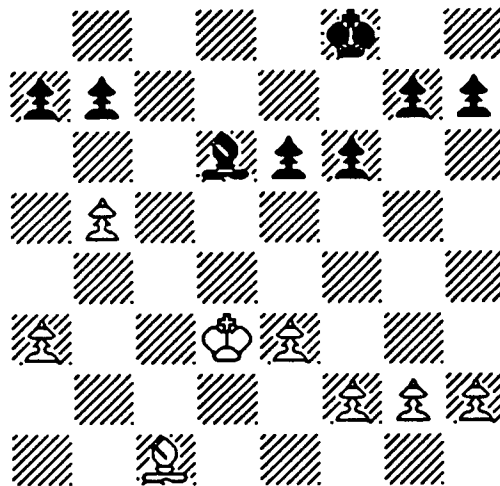


FIGURE 2
Endgame position 1 from Fischer-Spassky, Reykjavik, 1972





MEPHISTO-ZARKOV: 1 ...Bxh2? 2 g3 g5 3 Ke2 a6 4 bxa6 bxa6 5 Kf3 Kf7 6 Kg2 Bxg3 7 fxg3 g4 8 Kf2 h5 9 e4 Ke7 10 Bb2 e5 11 Ke3 Kf7 12 a4 Ke7 13 Kd3 Ke6 14 Bc3 Kd7 15 Kc4 Ke6 16 Kc5 f5 17 Bd2 fxe4 18 Be3 a5 19 Kc6 Kf6 20 Kd6 Kf5 21 Kd5 h4 22 gxh4 g3 23 h5 g2 24 h6 Kf6 25 Kxe4 Kg6 26 Kxe5 1:0.

ROUND 2: This is a famous endgame in which Capablanca beat Yates twice (!) over a short period of time (Hastings 1930–31). It almost led endgame theorists to mistakenly believe that this ending (Rook + 4 pawns vs. Rook + 3 pawns) is a win for White. Knowledge of Rook and Pawn endgame theory is critical to the correct play in this position. Basic theory is that after Black plays ...h5 it should be a draw because White cannot try to make progress without trading into drawn Rook and 3 Pawns vs. Rook and 2 Pawn endings. However, the correct defense still poses a number of hurdles for Black to overcome.

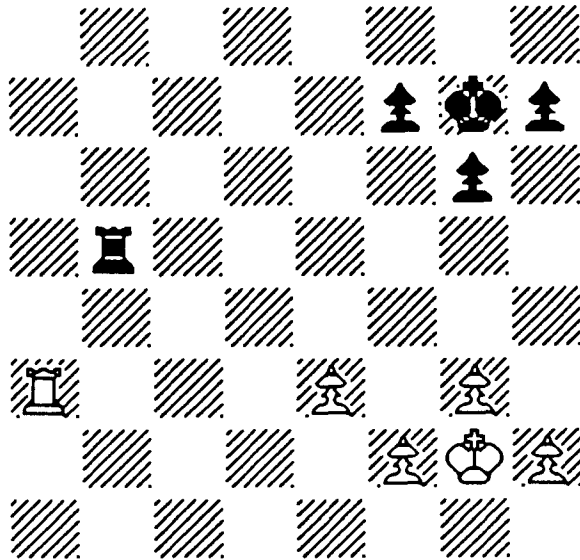


FIGURE 3
Endgame position 2 Capablanca-Yates, Hastings, 1930–31

Black may be already lost in the following continuation after 4 ...Ke6?. Black's best chance to hold a draw is 4 ...Rb6.

MEPHISTO-M CHESS: 1 h4 Kf6 2 f4 h5 3

Kf3 Rb2 4 e4 Ke6 5 Ra6+ Ke7 6 f5 gxf5 7 exf5 Rb4 8 Rh6 Rb3+ 9 Kg2 Rb4 10 Rxh5 Kf6 11 Rh7 Rc4 12 Kh3 Rc3 13 Kg4 Rb3 14 Rh6+ Ke5 15 Rc6 Rb8 16 Rc7 Kf6 17 Rc4 Ke5 18 Rc5+ Kf6 19 Kh3 Rb7 20 g4 Rb3+ 21 Kg2 Rb2+ 22 Kg3 Rb3 23 Kf4 Rb4+ 24 Kf3 Rb3+ 25 Ke2 Rh3 26 g5+ Kg7 27 Rc4 Rb3 28 Kf2 Rb5 29 Rf4 Rb2+ 30 Kg3 Rb1 31 Kg4 Rh1 32 Kh5 Rd1 33 f6+ Kh7 34 Re4 Rg1 35 Re7 Kg8 36 Kh6 Kf8 37 Rb7 Ke8 38 Kg7 Rg4 39 Re7+ 1:0.

In the next example, with colors reversed, after White allows 8 ...Rg2 the game is fairly clearly drawn.

M CHESS-MEPHISTO: 1 Ra6 Rb2 2 Kf3 h5 3 h4 f5 4 Kf4 Rb4+ 5 Ke5 Re4+ 6 Kd5 Rb4 7 Rc6 Rb2 8 f3 Rg2 9 Rc4 Rxc3 10 Rf4 Rg2 11 e4 fxe4 12 fxe4 Rg4 13 Ke5 g5 14 hxg5 Rxc5+ 15 Ke6 Rg4 16 Rf7+ Kg6 17 e5 h4 18 Rf6+ Kg5 19 Rf5+ Kg6 20 Rf8 Kg5 21 Rg8+ Kf4 22 Rh8 Kg3 23 Kd5 h3 24 e6 h2 25 e7 Rh4 1/2:1/2.

Round 3: This double-edged position occurred in Flohr-Keres, Semmering-Baden, 1937. The game ended in a draw after 1 Ng6 which, Fine praises (BCE #456). It seems that the programs' choice of 1 Ba4 steers the ending in White's favor.

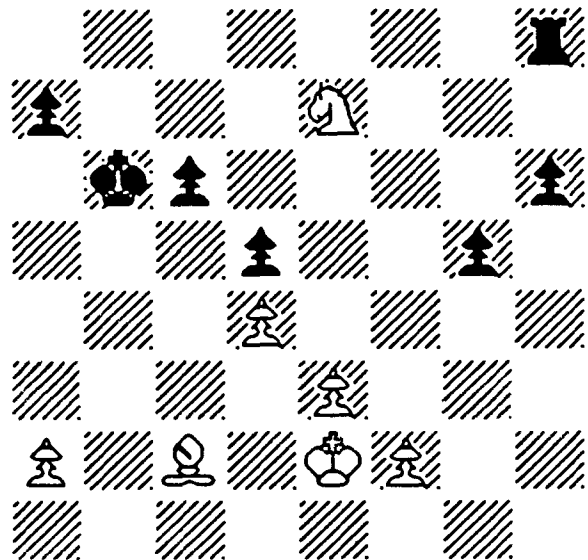


FIGURE 4
Endgame position 3 from Flohr-Keres, Semmering-Baden, 1937





Here both sides seem to squeeze the most out of the position.

MCHESSE-ZARKOV: 1 Ba4 c5 2 Nxd5+ Ka5 3 Bb3 cxd4 4 exd4 h5 5 Kf3 h4 6 Kg2 h3+ 7 Kh2 Rh4 8 f3 Kb5 9 Nc3+ Kb4 10 Ne2 Ka3 11 d5 Kb4 12 d6 Kc5 13 d7 Rh8 14 Be6 Kd6 15 Bxh3 g4 16 fxe4 Kxd7 17 g5+ Kd6 18 Kg3 Re8 19 Nf4 Re3+ 20 Kg4 Ra3 21 g6 Ke7 22 Kg5 Ra6 23 Be6 Ra5+ 24 Bd5 Ra3 25 g7 Rg3+ 26 Kh6 a5 1:0

Brief observations: Patterns like the trapped bishop (1 ...Bxh2??) in Position 1 are particularly difficult for computers to comprehend. The fact that the bishop is trapped can be clouded with the horizon effect and a program often requires very deep search to see that the piece is or is not trapped. Where theory is established in cer-

SCORECARD FOR THE ENDGAME CHAMPIONSHIP						
#	Program	Round 1	Round 2	Round 3	Total Points	Place
1	MEPHISTO	3 2	2 3½	4 5½	5½	1
2	M CHESSE	4 2	1 2½	3 4	4	2
3	ZARKOV	1 0	4 1½	2 2	2	3
4	NOW	2 0	3 ½	1 ½	½	4

Note: Each entry in the "Round" column denotes the opponent, the color played, and the cumulative points earned.

tain endings, for example Position 2, there seems to be plenty for programs to learn from human experience. In more complex tactical endgames, i.e., Position 3, expect new contributions from programs. It can be said that MEPHISTO and M CHESSE play the endgame quite well in general. ♠

Announcing

DIMACS: Series in Discrete Mathematics and Theoretical Computer Science

A series of workshop publications supported by the Center for Discrete Mathematics and Theoretical Computer Science (DIMACS), an NSF Science and Technology Center

Volume I:

Polyhedral Combinatorics:

Workshop June 12-16, 1989

William Cook & Paul D. Seymour, eds.

1990 288 pp. ISBN 0-89791-431-7

ACM Order# 222914

Nonmembers \$51.00 ACM Members \$31.00

Volume II:

Distributed Computing and Cryptography:

Workshop Oct. 4-6, 1989

Joan Feigenbaum & Michael Merritt, eds.

1990 262 pp. ISBN 0-89791-384-1

ACM Order# 222910

Nonmembers \$51.00 ACM Members \$31.00

Forthcoming! Volume III:

Computer Aided Verification, '90

Workshop June 18-21, 1990

R.P. Kurshan & E.M. Clarke, eds.

May 1991 c.200 pp.

ISBN 0-89791-386-8

ACM Order# 222913

Nonmembers \$51.00

ACM Members \$31.00

Forthcoming! Volume IV:

Applied Geometry and Discrete Mathematics:

The Victor Klee Festschrift

Peter Grizmann & Bernd Sturmfels, eds.

June 1991 c.432 pp.

ISBN 0-89791-385-X

ACM Order# 222911

Nonmembers \$51.00

ACM Members \$31.00

Forthcoming! Volume V:

Reliability of Computer and Communication Networks

Workshop December 2-4, 1989

Fred Roberts, Frank Hwang, and Clyde Monma, eds.

June 1991 c.200 pp.

ISBN 0-89791-387-6

ACM Order# 222912

Nonmembers \$51.00

ACM Members \$31.00

These publications are available to ACM members through ACM.