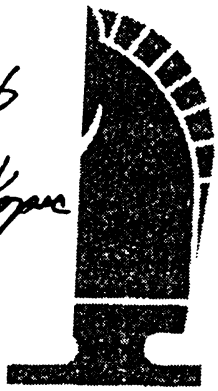
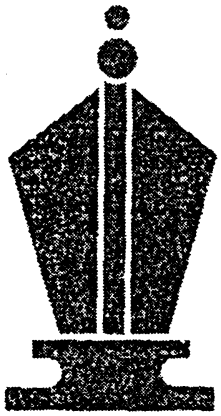
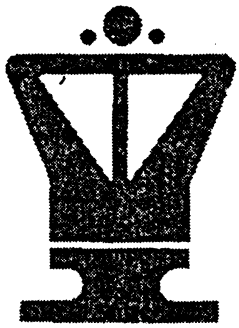
Letter Requesting Connection to ⇒ State UNIVERSITY OF MAINE, sent Danny Kopec

Belle and Mephisto Dallas Capture Computer Chess Titles at the FJCC

Danny Kopec *San Diego State University*
Monty Newborn *McGill University*







BELLE, a computer program developed by Ken Thompson and Joseph Condon of AT&T Bell Laboratories, captured first-place in this year's Seventeenth North American Computer Chess Championship and MEPHISTO DALLAS, developed by Richard Lang took first-place honors at the Sixth World Microcomputer Chess Championship.

The two major computer chess championships were held at the ACM/IEEE Computer Society's Fall Joint Computer Conference in Dallas. The ACM's NACCC was held in the Anatole Hotel and the WMCC took place in the Dallas Infomart. The two tournaments together made this the world's largest computer chess event: a total of 40 games in the NACCC and 49 games in the WMCC were played for a total of 89 games over a six day period. The WMCC took place during the days, while the evenings were devoted to the ACM's NACCC. Some programs participated in both tournaments.

Chess trees averaging 1,000,000 positions were searched on each move. With games lasting an average of fifty moves, a total of approximately $50 \times 2 \times 1{,}000{,}000 \times (40 + 49) = 890{,}000{,}000{,}000$ chess positions were searched by the programs during the course of the approximately 8900 moves played, making this event one of the great experimental efforts in computer science. Robert Tarjan, when receiving the Turing Award at the conference, noted the need for more such experimental work to complement the efforts being made in the theoretical analysis of complex algorithms.

The Seventeenth North American Computer Chess Championship

Ken Thompson and Joe Condon's BELLE came out of retirement and won all five of its games to capture first place at the NACCC's tournament. All games went to the endgame where BELLE outplayed its opponents, even in positions where it was behind in material. It is not clear how much the program was either improved, or had bugs eliminated which hurt it in tournaments in 1983–4. Thompson and Condon spent little time working on BELLE over the last two years. Thompson, in particular, devoted his energies instead to developing databases for chess endgames such as KQ vs. KR, KBB

vs. KN, KQP vs. KO, etc. His findings have surprised the chess world and have forced FIDE, the world's governing chess organization to change the rules of chess.

Thompson, an avid pilot, flew to the conference from his home base at AT&T Bell Laboratories in Murray Hill, New Jersey. He simply planned to enjoy watching the event. But at the urging of the other participants, he entered BELLE at the last minute when CRAY BLITZ withdrew because it was unable to get computer time. Earlier in the year, CRAY BLITZ won the Fifth World Computer Chess Championship in Cologne, West Germany. HITECH, the winner of last year's ACM tournament, also skipped this year's event. Hans Berliner, preoccupied with making major revisions in his HITECH program, passed up this year's tournament. Thus, the showdown expected between CRAY BLITZ and HITECH failed to materialize, but BELLE's excellent play made one almost forget their absence.

BELLE won the $2000 first place prize, the winner's trophy, and possession for the year of the CDC Plaque. Finishing in second place was LACHEX, the work of Burt Wendroff and Tony Warnock of Los Alamos National Laboratory. Third place went to David Kittinger's program, NOVAG EXPERIMENTAL.

A total of sixteen teams participated, including entries from Canada, England, Holland, West Germany, Denmark, and the United States; all used computers located in North America. Four multiprocessing systems participated: PHOENIX used 20 SUN-3 workstations located at SUN Microsystems, in Mountain View, Calif., FIDELITY EXPERIMENTAL used 28 6502's and one Z-80, OSTRICH ran on an 8-processor Data General system, and WAYCOOL, a new program developed at Cal Tech, used a 128-processor N-cube. Three programs, BELLE, BEBE, and CHIPTEST, took advantage of specially designed circuitry that generated moves and scored positions at high speeds. Six entries used single microprocessors. At the other extreme, LACHEX used a Cray X/MP.

The Sixth World Microcomputer Chess Championship

The level of play at this year's microcomputer chess championships was very strong, approximately equivalent to that of the NACCC just a few years ago. MEPHISTO DALLAS 3 captured the $2000 first place prize, winning six of seven points. Fidelity International's FIDELITY "2533" won the runner-up position with a score of five and one half points. MEPHISTO DALLAS 2 was third with five and one half points.

1987 TOURNAMENT RESULTS

ACM's Seventeenth North American Computer Chess Championship

		1	2	3	4	5	total
1	BELLE	15+■	2+□	6+■	4+■	7+□	5
2	LACHEX	9+□	1–■	13+□	10+■	4+□	4
3	NOVAG	7–□	16+■	12=□	8+■	6+□	3½
4	BEBE	11+□	12+■	8+■	1–□	2–■	3
5	PHOENIX	8–□	9–■	15+□	13+■	10+□	3
6	MEPHISTO	13+□	10=■	1–□	9+□	3–■	2½
7	CHALLENGER	3+■	8–□	9=■	14+□	1–■	2½
8	RECOM	5+■	7+■	4–□	3–□	11=■	2½
9	CYRUS	2–■	5+□	7=□	6–■	14+□	2½
10	FIDELITY	16+■	6=□	14+■	2–□	5–■	2½
11	CHIPTEST	4–■	14–□	16+□	12+■	8=□	2½
12	MERLIN	14=■	4–□	3=■	11–□	15+□	2
13	VAXCHESS	6–■	15+□	2–■	5–□	16+■	2
14	OSTRICH	12=□	11+■	10–□	7–■	9–■	1½
15	WAYCOOL	1–□	13–■	5–■	16=□	12–■	½
16	REX	10–□	3–□	11–■	15=■	13–□	½

The Sixth World Microcomputer Chess Championship

		1	2	3	4	5	6	7	total
1	MEPHISTO 3	11+■	7+□	4+□	2+■	8+□	9+■	6–□	6
2	FIDELITY A	14+□	3+■	5+■	1–□	6=■	8+□	12–■	5½
3	MEPHISTO 2	10+□	2–□	6=■	11+■	7=□	13+■	4+■	5
4	FIDELITY C	9+□	6+□	1–■	8=■	5+□	12+■	3–□	4½
5	MEPHISTO 1	8+□	10+■	2–□	7+□	4–■	11+■	9=□	4½
6	RECOM A	12+□	4–■	3=□	10+■	2=□	7–■	1+■	4
7	FIDELITY B	13+□	1–■	12+□	5–■	3=■	6+□	10–□	3½
8	RECOM C	5–■	14+□	11+■	4=□	1–■	2–■	13+□	3½
9	RECOM B	4–■	11–□	14+■	12+■	10+□	1–□	5=■	3½
10	CYRUS B	3–■	5–□	13+■	6–□	9–■	14+□	7+■	3
11	CYRUS A	1–□	9+■	8–□	3–□	13=■	5–□	14+■	2½
12	CYRUS C	6–■	13+□	7–■	9–□	14+■	4–□	2–□	2
13	CHESS MONSTER	7–■	12–■	10–□	14+■	11=□	3–□	8–■	1½
14	KEMPELEN	2–■	8–■	9–□	13–□	12–□	10–■	11–□	0

Computing System Information ACM's
Seventeenth North American Computer Chess Championship

Program	Computing system and language	Book	Nodes per second
BEBE	SYS-10 Chess Engine*, assembler, 65Kb, 16 bits, 10 mips. (Tony Scherzer, Linda Scherzer)	4K	40K
BELLE	PDP 11/23 with special chess circuitry, at AT&T Bell Laboratories, Murray Hill, New Jersey. (Ken Thompson, Joe Condon)	400K	150K
CHESS CHALLENGER EXPERIMENTAL	28 6502-based microprocessors controlled by a Z-80. (Ron Nelson, Dan Spracklen, Kathe Spracklen, Danny Kopec, Boris Baczynskyj)	16K+	NA
CHIPTEST	SUN 3 plus high speed move generator, assembler, at Carnegie-Mellon Univ. (Thomas Anantharaman, Feng-hsiung Hsu)	NA	150K
CYRUS 68K	68020-based microcomputer*, assembler. (Mark Taylor, David Levy, Kevin O'Connell)	16K	4K
FIDELITY EXPERIMENTAL	68020-based microcomputer*, assembler. (Dan Spracklen, Kathe Spracklen, Danny Kopec)	30K	NA
LACHEX	Cray X-MP 48, Fortran and assembler, at Cray Research, Chippewa Falls, Minnesota. (Tony Warnock, Burt Wendroff)	4K	50K
MEPHISTO MOTOROLA	68020-based microcomputer*, assembler, 64 Kb RAM, 32 bits, 4 mips. (Richard Lang)	NA	NA
MERLIN	IBM 3081, Pascal, 12 mips, at IBM Dallas. (Hermann Kaindl, Marcus Wagner, and Helmut Horacek)	6K	0.6K
NOVAG EXPERT EXPERIMENTAL	6502-based microcomputer*, assembler, 56 Kb ROM. (David Kittinger)	22K+	2–3K
OSTRICH	8 DG computers: 1 Eclipse S/120, 6 Nova 4's, 1 Nova 3, on high speed DMA bus, 64 Kb/computer, 16 bits, 1mips/computer. at McGill University. (Monty Newborn)	4K+	2K
RECOM-REBEL 87	6502 gate array processor*, assembler. (Ed Schroder)	NA	NA
REX III	Intel 80286-based microcomputer*, Pascal. (Don Dailey)	0.1K+	0.3K
SUN PHOENIX	20 SUN 3 Workstations, C, at SUN Microsystems, Mountain View, California. (Jonathan Schaeffer, Marius Olaffson)	0.8K	20K
VAXCHESS	Microvax 2*, C + assembler. (Tony Guilfoyle, Richard Hooker)	14K	1K
WAYCOOL	N-cube (128 processors @ 128Kb/proc., 1 mips/proc), at Cal Tech. (Ed Felton, Rod Morrison, Steve Otto)	15K	14K

* Computer was at site.

A total of fourteen teams representing six commercial concerns participated in the seven round Sixth World Microcomputer Chess Championship. This included three entries from Hegener and Glaser AG of West Germany, which used a program developed by Richard Lang, three from Fidelity International, Inc., of Miami, Florida (Dan Spracklen, Kathe Spracklen, Ron Nelson, with book openings by Danny Kopec and Boris Baczynskyj), three from E. G. H. Schroeder of The Netherlands, three from Intelligent Chess Software Ltd., of London, England, and one each from Enlightenment, Inc., of the United States, and Andromeda Software, Inc., of the United States. The program used by Andromeda Software was developed in Hungary by Gyula Horvath. There was a limit of three entries from any single commercial concern.

The Dallas chess club provided assistance during the tournament. Glenn Sharpe and Kermit Poulas helped

Computing System Information
Sixth World Microcomputer Chess Championship

Program	Computing system	Organization
ATARI KEMPELEN	Atari ST, 68000-based microcomputer	Andromeda Software, Inc.
CHESS MONSTER	IBM PC, 8086-based microcomputer	Enlightenment, Inc.
CYRUS 68K A	68020-based microcomputer	Intelligent Chess Software Ltd.
CYRUS 68K B	"	"
CYRUS 68K C	"	"
FIDELITY "2533" A	68020-based chess machine	Fidelity International Inc.
FIDELITY "2533" B	"	"
FIDELITY "2533" C	"	"
MEPHISTO DALLAS 1	68020-based chess machine	Hegener and Glaser
MEPHISTO DALLAS 2	"	"
MEPHISTO DALLAS 3	"	"
RECOM-DEVENTER A	6502-based microcomputer	E. Schroder
RECOM-DEVENTER B	"	"
RECOM-DEVENTER C	"	"

with local arrangements. Mike Valvo served as tournament director for both events and Tony Marsland acted as assistant director.

Data on the participants in both tournaments, the results of both tournaments, as well as other major tournaments in past years, are given following the presentation of some of BELLE's play.

Next Year

The eighteenth NACCC will be held next year at the FJCC. Plans are for a four round event, with the first two rounds on Sunday, October 25, one on Monday, October 26, with the final round on Tuesday, October 27. The winning entry will receive a $2000 prize. Tony Marsland will be the moderator at a technical session. For further information or application forms, please write to Monty Newborn, School of Computer Science, McGill University, 805 Sherbrooke Street West, Montreal, Quebec, Canada H3A 2K6 (514-398-7979).

BELLE

In winning the tournament with a perfect 5–0 score, BELLE played three particularly interesting games. Below, we annotate fully its game with runner-up LACHEX, and present two endgames which BELLE won from seemingly inferior positions or material deficits.

Round 5 ACM's Seventeenth NACCC

BELLE versus LACHEX C24/05

04.Bb4

1. e4 e5 2. Bc4 Nf6 3. d4

BELLE's second move defined the Bishop's Opening which usually leads to tamer play in modern tournament practice. Recent practitioners, including grandmasters Nunn and Larsen, prefer a slow central and a queen-side buildup for White with 3. d3, 4. Nf3, O-O, c3, followed by d4 or b4. Instead with the text move BELLE enters an open game, which nonetheless should not lead to any advantage for White.

3. . . . exd4 4. Nf3 Bb4+?!

This move takes the game out of theory, and is inferior because White can now force play. Normal here are 4 . . . d5 and 4 . . . Nxe4. A continuation after the former move leading to equality according to the Encyclopedia of Chess Openings, Vol C/col. 24, pg. 130, is: 4. . . . d5 5. exd5 Bb4+ 6. c3 Qe7+ 7.Kf1 dxc3 8. Nxc3 O-O 9. Bg5 h6 10. Bh4 Bf5 11. Qxd4 Nbd7 which occurred in Estrin-Vataikov, USSR, 1961.

5. c3 dxc3 6. bxc3 Bc5 7. e5 Qe7 8. Be3!?

A clever move, but not the best. Black would be hard pressed after simply 8. O-O; then on 8. . . . Ne4 9. Bd5 (or 9. Qd3) would be strong for White; on 8. . . . Ng4 9. Bg5; finally on 8. . . . Ng8 9. Bg5 is still very strong. Underlying BELLE's choice, (and probably most computer programs in this position) is the chance for Black to make the trade of B+N for R+2p's, after the suggested 8. O-O Ne4 9. Bd5 Nxf2 10. Rxf2 Bxf2+ 11. Kxf2, but more than 100 years of tournament praxis by humans have demonstrated this to be a poor trade in such positions.

8. . . . Ne4

Not 8. . . . Bxe3? 9. exf6 winning for White.

9. Qd3 Bxe3 10. Qxe3 Nc5 11. O-O O-O 12. Rd1

For the pawn deficit, White enjoys some space. The text prevents the liberating . . . d6.

12. . . . Nc6 13. Bd5!

This move continues to apply pressure, and takes the sting out of 13. . . . Re8.

13. . . . b6 14. Nd4 Bb7 15. Bxc6 dxc6?

A poor choice, as the B/b7 never comes to life.

16. Nf5 Qe6 17. Nd4

Now 17. Qg5 g6 18. Nh6+ Kh8

19. Ng4 looks like a promising attacking continuation for White. A key question here is, would BELLE have settled for a draw after 17. . . Qe7 18. Nf5 etc.? 17. Qg6 18. f4 Qe4 19. Qg3 Ne6 20. Nxe6 fxe6 21. Rd7

White finally finds some semblance of an attack. Black's best bet here is 21. . . g6 with counterplay on f4.

21. . . Rf7 22. Rxf7 Kxf7 23. Nd2

White keeps an initiative just sufficient to pose Black with continuous problems. Given a free move or two, Black would quickly win with . . . c5 and . . . Rd8.

23. . . . Qe2 24. Nf3 Qe3+ 25. Kh1 Kg8 26. Rd1! (Figure 1)

Bringing White's last piece into the attack by seizing the only open file. White threatens to win: 27. Rd7 Rf7 28. Rxf7 Kxf7?? 29. Ng5+ wins for White, but Black's best defense may entail this line with 28. . . Qc1+! 29. Ng1 Kxf7. The intermediary check with 28. Rd8+ Rf8 29. Rd7 extending the variation to 10 ply may have caused LACHEX's search to miss this defense.

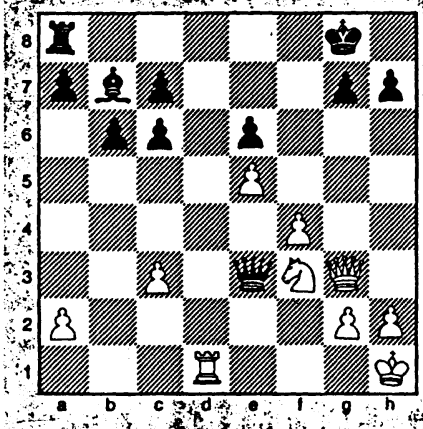


FIGURE 1. Position after 26! Rd1!

26. . . . Kh8 27. Rd7 Rg8 28. Rxc7.

BELLE finally recoups the pawn sacrificed in the opening.

28. . . . Ba8 29. Ng1!

White eliminates Black's only active piece, solves the back rank problem, and prepares for the endgame.

29. . . . Qxg3 30. hxg3 c5 31. Rxa7 h6 32. Ra6 Rb8 33. Kh2 h5?

This eases White's technical problems by weakening g5. Indicated is 33. . . . Bd5.

34. Nf3 Be4 35. Ng5 Bd5 36. a4 Bc4 37. Ra7 Kg8 38. a5 bxa5 39. Rxa5 Rc8 40. Ne4 Bd5 41. Rxc5 Rxc5 42. Nxc5 Kf7 43. Kh3 Ke7 44. Nd3 Kd7 45. Kh4 g6 46. Kg5 Ke7 47. Nb4 Be4 48. c4 Kd7 49. c5 Kc7 50. Kf6 Bf5 51. Ke7 Bg4 52. Nc2 Kc6 53. Nd4+ Kxc5 54. Nxe6+ 1–0.

Round 4: ACM's NACCC BEBE versus BELLE

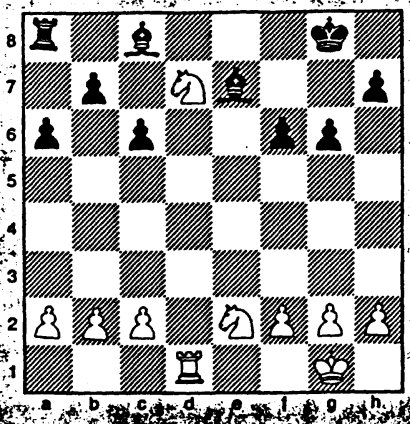


FIGURE 2. Position with Black to play on move 22

In this critical 4th Round game, BELLE (Black) played 22. . . . Ra7? instead of 22. . . . Bxd7 23. Rxd7 Rd8! forcing the theoretically favorable ending of bishop vs. knight with pawns on both sides of the board.

White misses a golden opportunity to punish the error on Black's previous move, and prevent the extrication of Black's rook with 23. Nb6! Black's only viable continuation is then 23. . . . Bg4 (if 23. . . . Be6? 24. Nd4 Kf7 [24. . . . Bg4 25. f3 Bc5 26. Na4Bxd4+ 27. Rxd4 Bf5 etc. is probably Black's best; 24. . . . Bxa2? 25. Nc8 wins] 25. Nxe6 Kxe6 26. Nc8! wins) 24. Rd2 Bc5 25. Nd7 (or 25. Na4) and Black has still not succeeded in extricating his rook. Play continued: 23. h3? Kf7 24. b3 b5 25. Nb6 Be6 26. Nd4 Rb7 27. Nxe6 Kxe6 28. Re1+ Kf7 29. Nc8 Bc5 30. Rd1 Ee6 31. c3 a5 when White soon had to resign.

Round 5: ACM's NACCC BELLE versus CHALLENGER

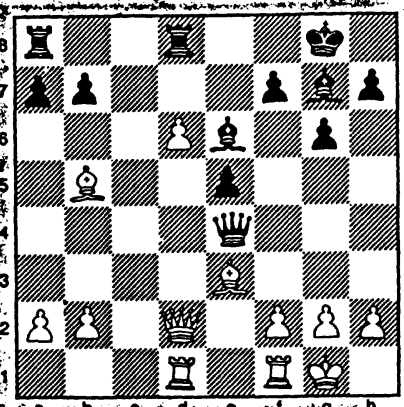


FIGURE 3. Position with Black to play on move 17

The diagrammed position at Black's seventeenth move is a critical one from the BELLE (W) vs. CHALLENGER (B) encounter. It is important to note that in this position the Black queen is threatened by 18. f3 Qf5 19. g4 Qf6 20. Bg5. The text move 17. . . . Bxa2 steals a pawn and at the same time frees the square e6 for the Black queen. Play continued: 18. Bg5 f6 19. Be3 Bb3 20. Qd3 Qxd3 21. Rxd3 Be6 22. Ra1! whereby BELLE went on to win the ending by demonstrating the power of the advanced passed d-pawn which cost Black an exchange (rook for bishop). It is difficult to suggest an improvement for Black here over 22. . . . a6 as played.

23. d7! Kf8 24. Ba4 e4 25. Rd2 b5?

Here CHALLENGER should play 25. . . . Bc4 with good chances to win the P/d7 eventually and/or shut out the R/d2 with . . . Bd3. A sample continuation could now go: 26. Bc5+ Kf7 27. Rd4 b5 (or 27. Bb6 Bd3 28. Bb3+ Ke7 etc.; or 28. Bd8 Rxd8 with excellent chances for full equality for Black).

26. Bxb5 axb5 27. Rxa8 Rxa8 28. d8 = Q+ Rxd8 29. Rxd8 + Kf7 30. Rb8 Bd7?

A passive move which contributes to Black's downfall; better is 30. . . . Bc4 with some drawing chances.

31. Bd4! h5 32. h4 Be8

Black gradually runs out of moves. BELLE went on to win the ending and the tournament with a perfect score of 5–0.

HISTORY OF MAJOR TOURNAMENTS

World Championships

Year	City	Winner	Runner-up
1974	Stockholm	KAISSA; Donskoy, Arlazarov, ICL 4/70	CHESS 4.0; Slate, Atkin, CDC 6600
1977	Toronto	CHESS 4.6; Slate, Atkin, CDC Cyber 176	DUCHESS; Truscott, Wright, Jensen, IBM 370/165
1980	Linz	BELLE; Thompson, Condon, PDP 11/23 with chess circuitry	CHAOS; Alexander, Swartz, Berman, O'Keefe, Amdahl 470/V8
1983	New York	CRAY BLITZ; Hyatt, Gower, Nelson, Cray XMP 48	BEBE; Scherzer, Chess engine
1986	Cologne	CRAY BLITZ; Hyatt, Gower, Nelson, Cray XMP/48	HITECH; Berliner, et al., SUN workstation with chess circuitry

ACM's North American Computer Chess Championships

Year	City	Winner	Runner-up
1970	New York	CHESS 3.0; Slate, Atkin, Gorlen, CDC 6400	DALY CHESS PROGRAM; Daly, King, Varian 620/I
1971	Chicago	CHESS 3.5; Slate, Atkin, Gorlen, CDC 6400	TECH; Gillogly, PDP 10
1972	Boston	CHESS 3.6; Slate, Atkin, Gorlen, CDC 6400	OSTRICH; Arnold, Newborn, DG Supernova
1973	Atlanta	CHESS 4.0; Slate, Atkin, Gorlen, CDC 6400	TECH II; Baisley, PDP 10
1974	San Diego	RIBBIT; Hansen, Crook, Parry, Honeywell 6050	CHESS 4.0; Slate, Atkin, CDC 6400
1975	Minneapolis	CHESS 4.4; Slate, Atkin, CDC Cyber 175	TREEFROG; Hansen, Calnek, Crook, Honeywell 6080
1976	Houston	CHESS 4.5; Slate, Atkin, CDC Cyber 176	CHAOS; Swartz, Ruben, Winograd, Berman, Toikka, Alexander, Amdahl 470
1977	Seattle	CHESS 4.6; Slate, Atkin, CDC Cyber 176	DUCHESS; Truscott, Wright, Jensen, IBM 370/168
1978	Washington	BELLE; Thompson, Condon, PDP 11/70 with chess hardware	CHESS 4.7; Slate, Atkin, CDC Cyber 176
1979	Detroit	CHESS 4.9; Slate, Atkin, CDC Cyber 176	BELLE; Thompson, Condon, PDP 11/70 with chess hardware
1980	Nashville	BELLE; Thompson, Condon, PDP 11/70 with chess hardware	CHAOS; Alexander, O'Keefe, Swartz, Berman, Amdahl 470
1981	Los Angeles	BELLE; Thompson, Condon, PDP 11/23 with chess hardware	NUCHESS; Blanchard, Slate, CDC Cyber 17
1982	Dallas	BELLE; Thompson, Condon, PDP 11/23 with chess hardware	CRAY BLITZ; Hyatt, Gower, Nelson, Cray 1
1983	Not held as the ACM's North American Computer Chess Championship that year but as the Fourth World Championship. See information above on this championship.		
1984	San Francisco	CRAY BLITZ; Hyatt, Gower, Nelson, Cray XMP/48	BEBE; Scherzer, Chess Engine, and FIDELITY EXPERIMENTAL; Sprackler, Fidelity machine
1985	Denver	HITECH; Ebeling, Berliner, Goetsch, Palay, Campbell, Slomer, SUN with chess hardware	BEBE; Scherzer, Chess engine
1986	Dallas	BELLE; Thompson, Condon, PDP 11/23 with chess hardware	LACHEX; Wendroff, Cray X-MP

World Microcomputer Championships

Year	City	Winner	Runner-up
1980	London	CHESS CHALLENGER	BORIS EXPERIMENTAL
1981	Travemunde	FIDELITY X	CHESS CHAMPION MARK V
1983	Budapest	ELITE A/S	MEPHISTO X
1984	Glasgow	Four way tie: ELITE X, MEPHISTO S/X, PRINCHESS, PSION CHESS	
1985	Amsterdam	MEPHISTO AMSTERDAM I	MEPHISTO AMSTERDAM II
1986	Dallas	MEPHISTO DALLAS 3	FIDELITY "2533"