

CHESS: Chess History, Experiments, and Search Symposium

Jonathan Schaeffer

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President, International Computer Chess Association



ICCA/ICGA

- International Computer Chess Association (ICCA) formed in 1977 to promote research in AI applied to chess
- Broadened scope, becoming the International Computer Games Association (ICGA) in 2002
- ICGA.org



ICGA

**International
Computer
Games
Association**



Thank You!

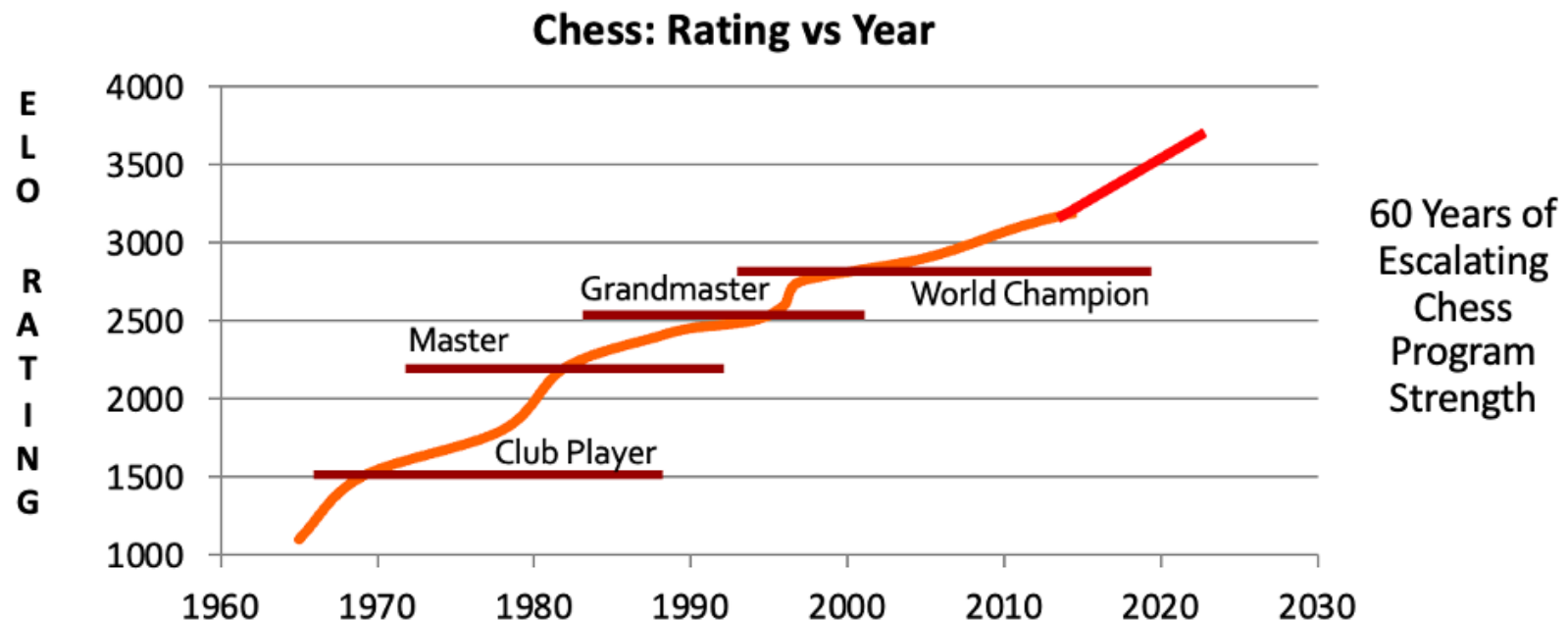


Dap Hartmann
Joke Hellemons
Jaap van den Herik
David Levy
Monty Newborn
Richard Pijl
ChessProgramming.org
Computer History Museum
All the participants

Computer Chess

One of AI's major success stories!

28th WCCC – 50th Anniversary Santiago de Compostela, Spain 2024



Computer Chess Pioneers

On the 50th anniversary of the WCCC, bring together many of the computer chess pioneers

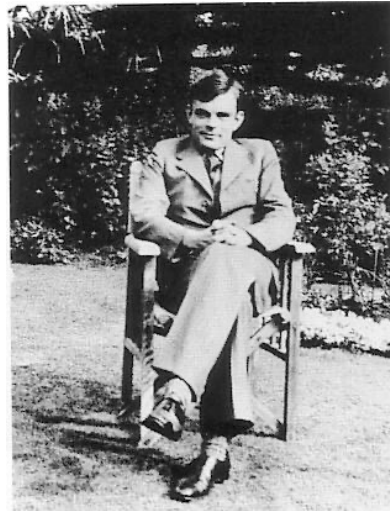
Emphasis was on participants prior to 1997

Apologies to those who we were unable to track down

Computer Chess Visionaries



Claude Shannon



Alan Turing



Los Alamos program

Herbert
Simon
and
Allen
Newell



John
McCarthy

Computer Chess Creators

Alan Kotok



Alex Bernstein

Richard Greenblatt
(MacHack)



Alpha-Beta

First paper on Alpha-Beta search



Alexander Brudno (1963). *Bounds and valuations for shortening the search of estimates*. *Problemy Kibernetiki* (10) 141–150.

[Alexey Brudno](#)

Computer Chess Competitions

Chess was one of the "grand challenges" of the fledgling field of AI.

Gave rise to annual computer chess tournaments, beginning in 1970 and continuing to this day.

Allowed us to benchmark computer performance – advances in software and hardware.

The longest ongoing experiment in Computer Science history!

Computer Chess: Knowledge

- Ad hoc
- King safety
- Piece mobility
- Piece-square tables
- Move ordering heuristics
- Parameter tuning
- Search extension heuristics
- Endgame databases
- Deep learning
- Neural networks
- NNUE

Computer Chess: Search

- Ad hoc
- Minimax
- Fixed-depth search
- Alpha-beta
- Transposition tables
- Killer heuristic
- Quiescence search
- Variable-depth search
- Conspiracy Numbers
- Null moves
- Futility cutoffs
- Singular extensions
- Monte Carlo tree search

Computer Chess: Hardware

- Mainframes
- Super computers
- Desktop machines
- Personal computers
- Small cluster of computers
- Multiprocessor shared-memory
- Custom hardware
- VLSI Chess Chips
- Large cluster of computers
- GPUs

New York, 1970

Team	Computer to be used, location	Program specifics approx. Memory req. Language, etc.
1. Dennis Cooper Bell Telephone Laboratories, Inc. Whippany, New Jersey	IBM 360/65 Bell Telephone Laboratories Whippany, N. J.	Requires about 22K of memory. ALL FORTRAN IV. Compiles in Fortran H.
2. Tony Marsland Computing Science Department University of Alberta Edmonton, Canada	Burroughs 5500 New York City	Program is written in Burroughs. Extended ALGOL for B-5500/ B-6500
3. Dan Drew Computer Science Department Texas A and M College Station, Texas and Rolf Smith Richards-Gebaur AFB Missouri and Franklin Ceruti Richards-Gebaur AFB Missouri	IBM 360/65 Texas A and M College Station, Texas	Written in FORTRAN IV for IBM/360 using G-level computer. With overlays, requires 72K, without overlay requires about 135K.
4. Hans Berliner Carnegie-Mellon Computer Center Carnegie-Mellon University	IBM 360/91 Columbia Univer. New York	Approx. 200-300K memory. Most of program is written in PL1 version IV.
5. Ben Mittman Vogelback Computer Center Northwestern University Evanston, Illinois and Keith Gorlan Bell Telephone Laboratories, Inc. Whippany, New Jersey (formerly of Northwestern) and Larry Atkin and David State Control Data Corporation (formerly of Northwestern)	CDC 6400 Vogelback Computer Center Northwestern University	Approx. 6000, 60-bit words, program is written in FORTRAN IV and COMPASS assembly language.
6. Kenneth L. King Information Displays, Inc. Mount Kisco, New York and Chris Daly NASA Goddard Space Flight Center Goddard, Maryland	Varian Data Machines 620/1 Computer (on site at N.Y. Hilton)	Requires about 4K of memory written in IDIOM language, a special purpose low level language to be used with Information Display's Inc. Varian 620/1 computer



Monty Newborn (organizer), sponsor representative, David Slate, Larry Atkin and Benjamin Mittman (Chess 3.0)

WCCC #1: Stockholm 1974

Program	#	Authors	Hardware	Language
Kaissa	4	Mikhail Donskoy, Vladimir Arlazarov, Anatoly Uskov, Georgy Adelson-Velsky	ICL 4-70	Assembly
CHAOS	3	Mike Alexander, Victor Berman, Ira Ruben, Fred Swartz, William Toikka, Joe Winograd	UNIVAC 1108	Fortran
Chess 4.0	3	Larry Atkin, David Slate	CDC 6600	Assembly
Ribbit	3	Gary Calnek, Russell Crook, Ron Hansen, Jim Parry	Honeywell 66/60	Fortran
Tech 2	2	Alan Baisley	PDP-10	Assembly
Ostrich	2	Monty Newborn, George Arnold	Nova 840	Assembly
Frantz	2	Fritz Königshofer, Gerhard Wolf	UNIVAC 494	Fortran
Master	2	Alex Bell, Peter Kent, John Birmingham, John Waldron	IBM 360/195	PL/I
Beal	2	Don Beal	CDC 6600	Fortran, Assembly
Freedom	1½	Nils Barricelli	CDC Cyber 74	unknown
Tell	1½	Johann Joss	HP 2115A	Algol 60
A16chs	1	Robert Prinsen	GCS-Alpha16	unknown



Vladimir Arlazarov, Anatoly Uskov, Mikhail Donskoy



Georgy Adelson-Velsky playing John McCarthy

WCCC #1: Stockholm 1974



David Slate (Chess 4.0) plays against
Fred Swartz and Ira Rubin (Chaos)



Ron Hansen and Jim Parry (Ribbit) playing
David Slate (Chess 4.0)



Mikhail Donskoy (Kaissa)
relaying the
moves from Moscow

Vladimir Arlazarov (1)



A.L. Brudno (1918-2009)

Head of Laboratory at the Institute of Electronic Control Systems. Author of the mathematical foundation of α - β pruning.



A.S. Kronrod (1921-1986)

Head of Laboratory at the Institute of Theoretical and Experimental Physics. Led computing research for atomic reactors.

Vladimir Arlazarov (2)



G.M. Adelson-Velsky (1922-2011)

The author in AVL trees.



V.L. Arlazarov (1939-)

Vladimir Arlazarov (3)



A.R. Bitman (1939-2013)

International Chess
Master. The only chess
expert on the team.



A. Jivotovsky (1940-1990)



A.V. Uskov (1938-2020)

Vladimir Arlazarov (4)



V.L. Arlazarov, A.R. Bitman, A. Jivotovsky

Vladimir Arlazarov (5)



The ITEF team is interviewed
(**A.V. Uskov, G.M. Adelson-Velsky**, Correspondent,
A.R. Bitman, V.L. Arlazarov, A. Jivotovsky)

Vladimir Arlazarov (6)



M.V. Donskoy (1948-2009)

Vladimir Arlazarov (7)



Transfer of chess moves from
Moscow to Stockholm
V.L. Arlazarov, E. Tõugu (IFIP
representative), A. Baraev



Gold Medal IFIP 1974

Vladimir Arlazarov (8)



V.L. Arlazarov and M.V. Donskoy
3rd World Computer Chess
Championship
Linz, 1980

Vladimir Arlazarov (9)



The developers of the rook endgame program with grandmaster Yuri Averbakh, study different positions using the program. Standing in the background is **Aron Futer**, the main developer of the program.

Sitting are **A. Bitman** and grandmaster Yuri Averbakh. Standing are **V. Arlazarov**, **A. Uskov**, **A. Futer**.



Vladimir Arlazarov (10)



Tony Marsland, Monty Newborn (and family), and Misha Donskoy in Moscow.

Monty Newborn and Vladimir Arlazarov in Zagorsk near Moscow.



Tony Marsland, Michael Donskoy, and Anatoly Uskov, hosted by Vladimir Arlazarov.



WCCC #2: Toronto, 1977

Program	#	Authors	Hardware	Language
CHES 4.6	4	Larry Atkin, David Slate, David Cahlander	CDC Cyber 176	Assembly
DUCHESS	3	Eric Jensen, Tom Truscott, Bruce Wright	IBM 370/165	PL/I, Assembly
KAISSA	3	Mikhail Donskoy, Vladimir Arlazarov, Anatoly Uskov, Georgy Adelson-Velsky	IBM 370/168	Assembly
BELLE	2½	Ken Thompson, Joe Condon	PDP-11, Chess Hardware	C
CHAOS	2½	Mike Alexander, Victor Berman, Ira Ruben, Fred Swartz, William Toikka, Joe Winograd	Amdahl 470v6	Fortran
MASTER	2	John Birmingham, Peter Kent	IBM 370/168	PL/I
OSTRICH	2	Monty Newborn, George Arnold	SuperNOVA	Assembly
DARK HORSE	2	Ulf Rathsman	CDC 6400	Fortran
WITA	2	Tony Marsland	Amdahl 470v6	Algol W
ELSA	2	Ludwig Zagler	TR 440	Assembly
BLACK KNIGHT	1½	Fred Prouse, Kenn Sogge, Gary Maltzen, Lonny Lebahn	UNIVAC 1110	Fortran
BLITZ 5	1½	Robert Hyatt	XDS Sigma 9	Fortran
BCP	1½	Don Beal	CDC 6400	Fortran, Assembly
CHUTE 1.2	1	Michael Valenti, Zvonko Vranesic	Amdahl 470v6	XPL
BS6676	1	Barend Swets	IBM 370/168	Fortran
TELL	0	Johann Joss	DEC KL-10	Algol 60



Kaissa versus Chess 4.6, an exhibition game played after the tournament.
 Top: Chess 4.6 (David Slate, David Cahlander, Larry Atkin) Bottom: Kaissa (Mikhail Donskoy, Vladimir Arlazarov)

WCCC #2: Toronto, 1977

Arlazarov (Kaissa)

Atkin, Slate,
Cahlander (Chess 4.6)

Beal (BCP)

Levy (commentator)

Newborn (Ostrich)

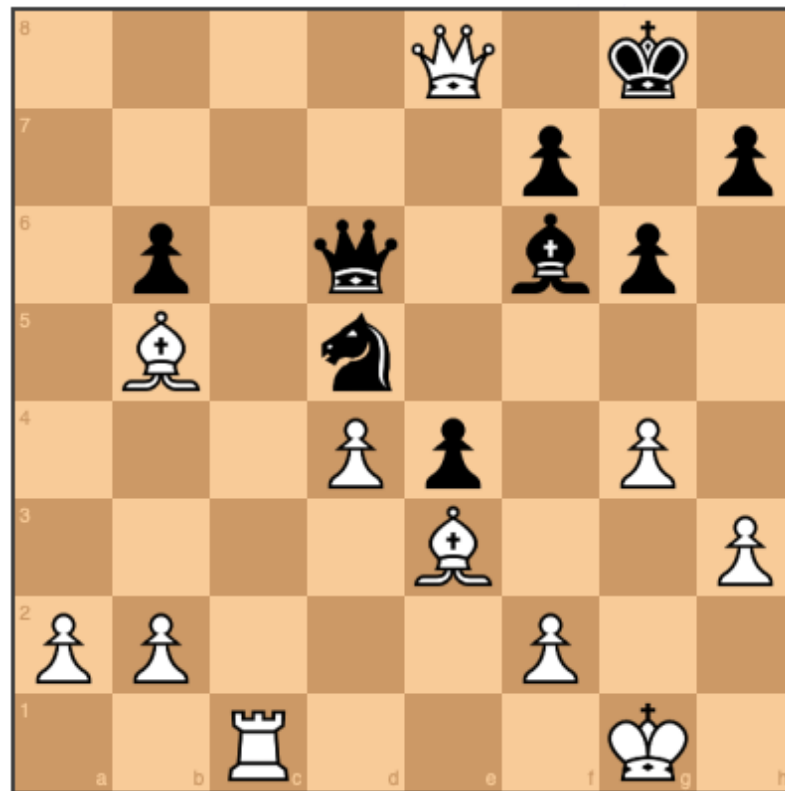
Thompson (Belle)

Tom Truscott (Duchess)



WCCC #2: Toronto, 1977

Kaissa



Duchess

WCCC #3: Linz, 1980

Program	#	Authors	Hardware
Belle	3½	Ken Thompson, Joe Condon	PDP-11/23, LSI-11, custom boards
CHAOS	3½	Mike Alexander, Victor Berman, Jack O'Keefe, Fred Swartz	Amdahl 470
Duchess	3	Tom Truscott, Bruce Wright, Eric Jensen	Amdahl 470v/8
L'Excentrique	2½	Claude Jarry	Amdahl 470v/7
Chess 4.9	2½	Larry Atkin, David Cahlander	CDC Cyber 176
Nuchess	2	David Slate, William Blanchard	CDC Cyber 176
Kaissa	2	Vladimir Arlazarov, Mikhail Donskoy	IBM 370/168
BCP	2	Don Beal	PDP-11/70
Bebe	2	Tony Scherzer	Bit Slice Chess hardware
Schach 2.3	2	Matthias Engelbach	Burroughs 7800
Awit	2	Tony Marsland	Amdahl 470v/7
Master	1½	John Birmingham, Peter Kent	IBM 3033
Ostrich 81	1½	Monty Newborn	Nova 4
MyChess	1½	David Kittinger, John Urwin	Cromenco Z80 System
Parwell	1½	Thomas Nitsche, Elmar Henne, Wolfram Wolff	Siemens SMS 201
Advance 1.0	1½	Mike Johnson, Dave Wilson	6502 + Bit Slice Chess hardware
Dark Horse	1	Ulf Rathsman	UNIVAC 1100/81
Chess Challenger	.5	Kathe Spracklen, Dan Spracklen, Ron Nelson, Ed English, Frank Duason	Z80 or 6502



Belle vs CHAOS playoff.
Ken Thompson, Frederick Friedel, Victor Berman, Fred Swartz, Mikhail Donskoy

WCCC #3: Linz, 1980



Don Beal



Don Beal
Ken Thompson
Monty Newborn
Mikhail Botvinnik

WCCC #4: New York, 1983

Program	#	Authors	Hardware	Language	N/sec
Cray Blitz	4½	Robert Hyatt, Harry Nelson, Albert Gower	Cray X-MP [6]	Fortran IV	25K-75K
Bebe	4	Tony Scherzer, Linda Scherzer	SYS-10, AMD Am2900 bit slice	Assembly	20K
Awit	4	Tony Marsland	Amdahl 5860/2	Algol W	8 x 200 branches
Nuchess	3½	David Slate, William Blanchard	Cray-1 4Mb	Fortran	3K
CHAOS	3½	Mike Alexander, Fred Swartz, Jack O'Keefe	Amdahl 5860	Fortran	.1K
Belle	3	Ken Thompson, Joe Condon	PDP-11/23+chess hardware	C	110K
Schach 2.7	3	Matthias Engelbach	Burroughs 7800	Algol	1K
Advance 3.0	3	Mike Johnson, Dave Wilson	Custom 6502+bit slice	Microcode	1.5K
Mephisto X	3	Elmar Henne, Thomas Nitsche	68000	Macros	.01K
Fidelity X	2½	Kathe Spracklen, Dan Spracklen	6502	Assembly	1K
Merlin	2½	Hermann Kaindl, Marcus Wagner, Helmut Horacek	Siemens 7.890 F	Pascal	.04K
Novag X	2½	David Kittinger, Scott McDonald	6502	Assembly	.6K
Phoenix	2½	Jonathan Schaeffer	Honeywell DPS 8/70	C	.3K
Ostrich	2	Monroe Newborn	Eclipse + 7 x Nova 4	Assembly	.6K
Pion	2	Sito Dekker, Roger Hünen, Gerlach van Beinum, Jan Derksen, Harry Nefkens, Jaap van den Herik	VAX 11/750	C	1K
BCP	2	Don Beal	Zilog Z8000	C, Assembly	20K
Patsoc 2.0	1½	Hans Berliner	DEC KL-10	BLISS 36	.16K
Conchess	1½	Ulf Rathsman	6502	Assembly	1K
Philidor X	1½	Mark Taylor, David Broughton, David Levy, Kevin O'Connell	IBM PC	Assembly	120
Bobby	1½	Hans-Joachim Kraas, Günther Schrüfer	IBM 4341-2	Pascal	150
Shy	1½	Juha Kasanen, Mika Korhonen, Timo Saari	Burroughs 7800/B7900	Algol	350
Sfinks X	0	William Fink	TRS-80 with 8088	Assembly	1.000

WCCC #4: New York, 1983



Harry Nelson and
Robert Hyatt
(Cray Blitz)

Ken Thompson
(Belle) and
Mikhail Botvinnik



Kathe Spracklen
& Dan Spracklen
(Fidelity X)

Monty Newborn (1)



Monty Newborn (2)

USA: 9, Canada: 3, England: 3, West Germany 3, Austria, Finland, The Netherlands, Sweden.

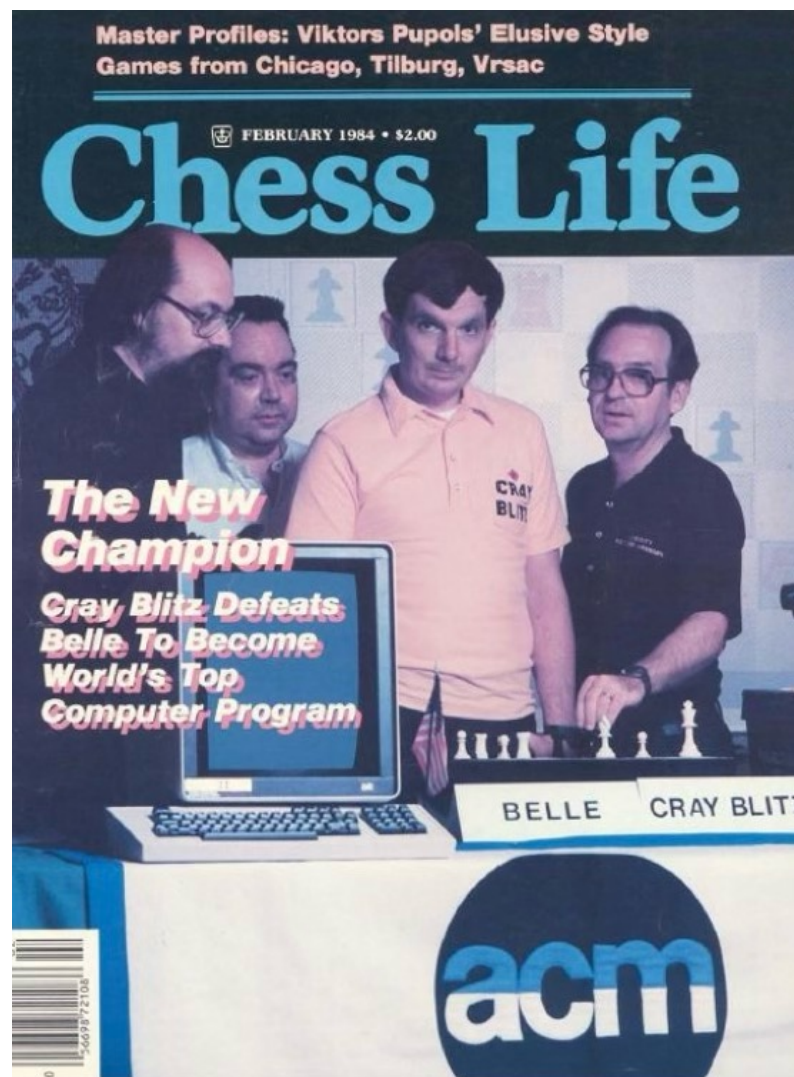
Half of the participant's computers were onsite.

Five rounds for the first time.

Playing strength of the top entries:
~2300 USCF (estimated as "expert" level in 1980).

Winner: Cray Blitz

Knocked off Belle, who knocked off Chess 4.6, who knocked off Kaissa



Monty Newborn (3)

Multiprocessors appeared for the first time.

Cray Blitz running on a dual processor CRAY-XMP.

Ostrich on an eight processor Data General NOVA system.



Monty Newborn (4)

Russian involvement (Kaissa didn't participate).

Good relations (started with Tony Marsland).

Botvinnik attended as our guest. He has also been our guest in Toronto, 1977.

WCCC 1983: Sammy Reshevsky, Reuben Fine, and Mikhail Botvinnik



Monty Newborn (5)

Botvinnik lectures at McGill
University (1977)



Newborn in Moscow with 1-year old
daughter Amy, Reznitski, Stillman,
Donskoy, and Botvinnik (1980)

Monty Newborn (6)

Ken Thompson and Dennis Ritchie awarded the Turing Award for their work on the UNIX operating system (New York, 1983)



WCCC #5, Cologne, 1986

Program	#	Authors	Hardware	Language	N/sec
Cray Blitz	4	Robert Hyatt, Harry Nelson, Albert Gower	Cray X-MP-48	Fortran, CAL	100K
Bebe	4	Tony Scherzer, Linda Scherzer	SYS-10, AMD Am2900 Bit slice	Assembly	45K
HiTech	4	Hans Berliner, Carl Ebeling, Murray Campbell, et al.	Sun-3 + Chess Hardware	C	175K
Sun Phoenix	4	Jonathan Schaeffer	2*10 Sun-3 with 68020	C	N.A.
Rebel	3	Ed Schröder, Jan Louwman	6502 TurboKit @ 10 MHz	Assembly	0.5K
Bobby	3	Hans-Joachim Kraas, Günther Schrüfer	Amdahl 470 V7B	Pascal	0.4K
Plymate	3	Ulf Rathsmann	6502	Assembly	2.5K
Mephisto X	3	Richard Lang, Ossi Weiner	68000	Assembly	2K
Dutch	3	Harry Nefkens, Roger Hünen, Jaap van den Herik	GOULD	C	1K
Nona	3	Frans Morsch, Hans van der Zijden	Mondial 65C02 system	Assembly	0.8K
Advance 68K	2½	Mike Johnson, Dave Wilson	68000	Assembly	0.1K
Lachex	2½	Burton Wendroff, Tony Warnock	Cray X-MP 4/16	Fortran, CAL	40K
Ostrich	2½	Monroe Newborn	Eclipse + 7 x Nova 4	Assembly	2K
Schach 2.7	2	Matthias Engelbach	B 7800	Algol	1.5K
Cyrus 68K	2	Mark Taylor, Kevin O'Connell, David Levy	IBM PC with 68020 card	Assembly	3K
Vaxchess	2	Tony Guilfoyle, Richard Hooker	MicroVAX	Assembly	0.8K
Chat	2	Wolfgang Delmare	CDC Cyber 175	Pascal	0.5K
BCP	1½	Don Beal	Zilog Z8000 system	Assembly	5K
Enterprise	1½	Kaare Danielsen	6301Y	Assembly	0.5K
Awit	1½	Tony Marsland	Amdahl 5860	Algol-W	0.01K
Rex	1	Don Dailey, Sam Sloan	80286 Tandy 3000	Pascal	N.A.
Shess	1	Ard van Bergen	MicroVAX II	Fortran, Assembly	0.4K
Kempelen	0	Attila Kovács	Atari 520 ST	C, Assembly	N.A.

WCCC #5, Cologne, 1986



Jonathan Schaeffer (Sun Phoenix)
and Tony Scherzer (Bebe)

Cray Blitz versus HiTech.
Harry Nelson, Hans
Berliner, Carl Ebeling



Richard Lang



WCCC #6, Edmonton, 1989

Program	#	Authors	Hardware	Language	N/sec
Deep Thought	5	Feng-hsiung Hsu, Murray Campbell, et al.	VLSI-Sys	C, Assembly	1,000K
Bebe	4	Tony & Linda Scherzer	Sys-10 bit slice	Assembly	45K
Cray Blitz	3½	Robert Hyatt, Albert Gower, Harry Nelson	Cray Y-MP/8	Fortran, CAL	100K
HiTech	3½	Hans Berliner, Carl Ebeling, Murray Campbell, Gordon Goetsch, Andrew Palay, et al.	VLSI-Sys	C	100K
Mephisto X	3½	Richard Lang	68020	Assembly	2K
Fidelity X	3	Dan & Kathe Spracklen, Ron Nelson	68030	Assembly	10K
AI Chess	3	Marty Hirsch	Dyna 8086	C, Assembly	2.5K
Merlin	3	Hermann Kaindl, Helmut Horacek, Marcus Wagner	IBM 3090	Pascal	N.A.
Much	2½	Jaap van den Herik, Roger Hünen, Harry Nefkens, Tom Pronk	Sun-4	C	3K
Sun Phoenix	2½	Jonathan Schaeffer	20 x Sun-4	C	10K
Novag X	2½	David Kittinger	6502	Assembly	2.8K
Zarkov	2½	John Stanback	HP 9000/835	C	2.5K
Y!89	2½	Ulf Rathsman, Lars Hjörth, Sandro Necchi	6502	Assembly	5K
Quest X	2½	Frans Morsch	6502	Assembly	8K
BP	2½	Robert Cullum	Unisys PW800 PC 386	C, Assembly	0.6K
Rebel X	2	Ed Schröder, Jan Louwman	6502	Assembly	2K
Kallisto	2	Bart Weststrate	Apple II	Assembly	4.5K
Waycool	2	Ed Felten, Steve Otto, Rod Morison	nCUBE10 512 x Intel 80286	C	N.A.
Pandix	2	Gyula & Zsuzsa Horváth	Sanyo PC 386	C, Assembly	0.3K
Rex	2	Don Dailey, Larry Kaufman	Unisys PW800 PC 386	Pascal	N.A.
Dappet	2	Dap Hartmann, Peter Kouwenhoven	Toshiba PC	Turbo Pascal	0.5K
Moby	1	Mark Taylor, Greg Wilson, David Levy	Meiko Computing Surface	Occam	0.25K
Shess	1	Ard van Bergen	Vax 8600	Fortran	0.4K
Centaur	0	Victor Vikhrev	IBM PS2/80 486	Pascal	1K

Shannon Trophy

Conceived of by Tony Marsland and
first awarded in Edmonton



Tony Marsland (1)

HONOURED GUESTS

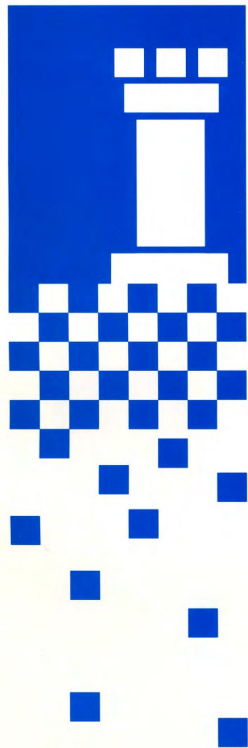
Each World Championship, two people who have distinguished themselves for their pioneering work in computer chess are honoured. This year, we are pleased to acknowledge the contributions of:

- John McCarthy A pioneer in artificial intelligence research. He was involved in the first international computer chess match USA vs USSR in 1966.
- Donald Michie Chief Scientist for the Turing Institute, noted expert in AI technique applications and proponent of computer chess research for more than two decades.

INVITED GUESTS

A number of well-known names in the computer/chess world are part of this year's championship. They include:

- Georgii Adelson-Velsky
Vladimir Arlazarov
- Mikhail Donskoy Authors of the program Kaissa, winner of the 1st World Computer Chess Championship, Stockholm, 1974.
- Hans Berliner Well known for his innovative work in computer chess, he is also a former World Correspondance Chess Champion.
- Monty Newborn He has organized computer chess events since 1970 and has been a frequent competitor with his Ostrich program.
- Claude Shannon Well-known for his work in information theory, he also wrote a pioneering paper on computer chess in 1948.
- Ken Thompson Inventor of the UNIX operating system and co-builder of the chess machine Belle, winner of the 3rd World Computer Chess Championship, Linz, 1980.



**WORLD
COMPUTER
CHESS
CHAMPIONSHIP**

AGT

Edmonton, Canada
May 28, 1989

Tony Marsland (2)



Ken Thompson
Claude Shannon
David Slate



Tony Marsland
Mikhail Botvinnik
Mikhail Donskoy

Tony Marsland (3)

Feng-hsiung Hsu (Deep Thought)
and Claude Shannon (Deep Thinker)



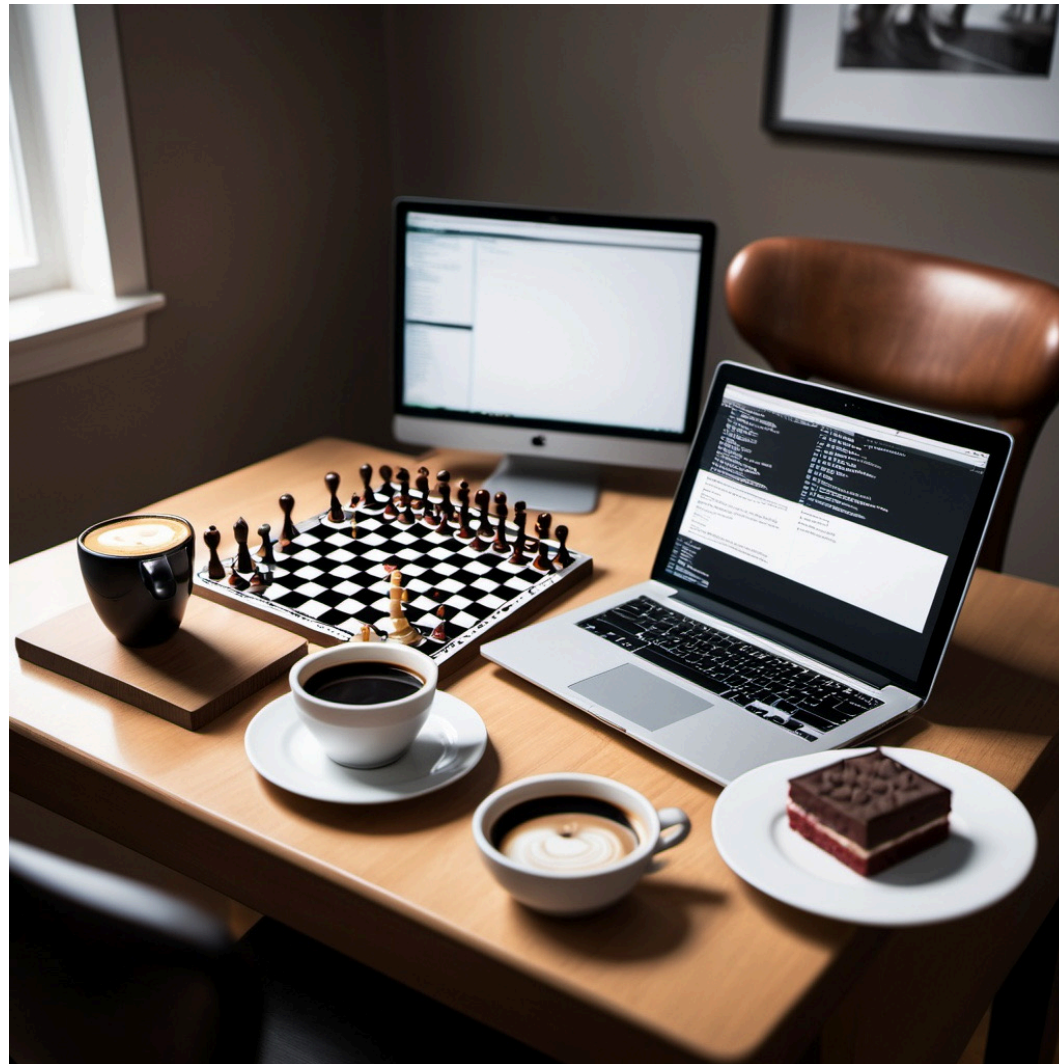
Murray Campbell

Tony Marsland (4)



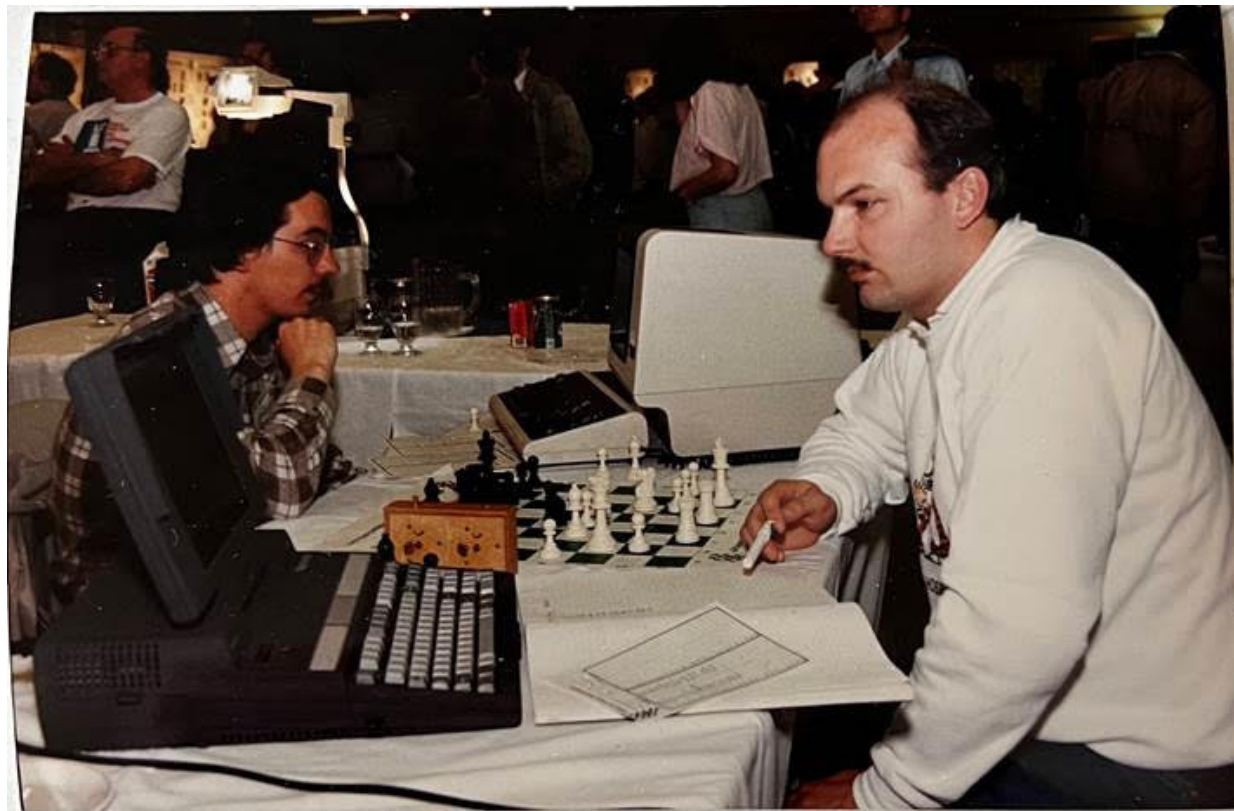
Claude Shannon
juggling potatoes

Chess, Computers, and Coffee Break



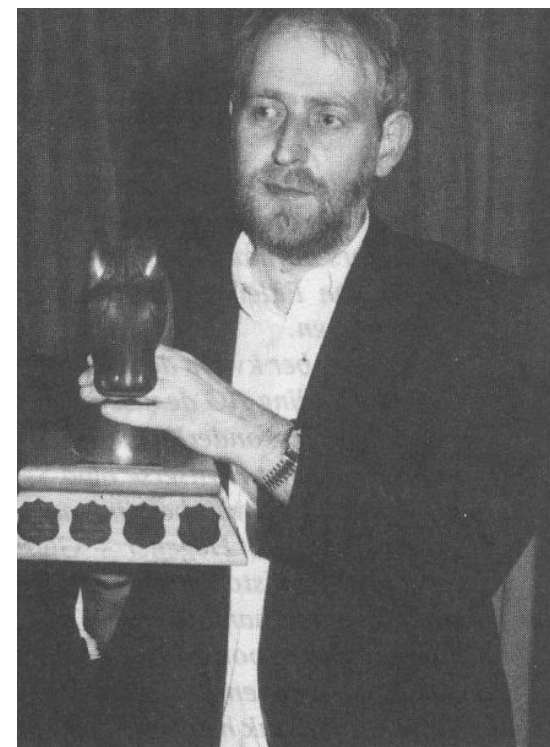
Dap Hartmann

The ICGA Journal in Pictures in the ICGA Journal



WCCC #7, Madrid, 1992

Program	#	Team	Hardware	Language	N/sec
ChessMachine WK	4½	Ed Schröder	IBM PC + ARM2 32MHz	Assembly	6.5K
Zugzwang	4	Rainer Feldmann, Peter Mysliwietz	1024 x Inmos T805	Occam	250K
Cumulus 2	4	Jean-Christophe Weill	486 PC 66 MHz	Assembly	15K
Kasparov Spare	3½	Dan and Kathe Spracklen	SPARC 51 MHz	Assembly	20K
Fritz 2	3½	Frans Morsch	486 PC 66 MHz	Assembly	20K
RISC 2500	3	Johan de Koning	ARM2 28 MHz	C, Assembly	3K
HiTech B*	3	Hans Berliner	VLSI-Sys	C, Microcode	120K
Chess Genius	3	Richard Lang	486 PC 50 MHz	Assembly	15K
Woodpusher	3	John Hamlen	486 PC 66 MHz	C	3.5K
MChess Pro	2½	Marty Hirsch	486 PC 66 MHz	C, Assembly	5.5K
HIARCS	2½	Mark Uniacke	SPARCstation 2	C	3K
Lachex	2½	Burton Wendroff	Cray Y-MP-2E	Fortran, CAL	40K
Pandix	2½	Gyula and Zsuzsa Horváth	486 PC 66 MHz	C, Assembly	10K
Kallisto	2	Bart Weststrate	486 PC 50 MHz	Assembly	10K
Ulysses	2	Ulf Lorenz, Valentin Rottmann	SPARCstation 2	C	5K
Prochess	2	Tom Pronk	486 PC 50 MHz	C	12.5K
Centaur	2	Victor Vikhrev, Alexey Manjakhin	486 PC 66 MHz	Pascal	0.05K
Nimzo Guernica	1½	Chrilly Donninger	486 PC 50 MHz	C, Assembly	5K
Échec	1½	Marc-François Baudot	486 PC 66 MHz	C	5K
Mirage	1	Yuri Shpeer, Vladimir Rybinkin	486 PC 66 MHz	Assembly	N.A.
Nightmare	1	Reinhold Gellner, Gaby von Rekowski	486 PC 66 MHz	C	6K
Delicate Brute	0	Don Beal	SPARCstation 2	C	10K



Ed Schroeder

WCCC #7



Final round: Kasparov Sparc vs ChessMachine WK

Seated: Ed Schroeder, Rob Kemper

Standing: Rainer Feldmann, Burkhard Monien, Dieter Steinwender

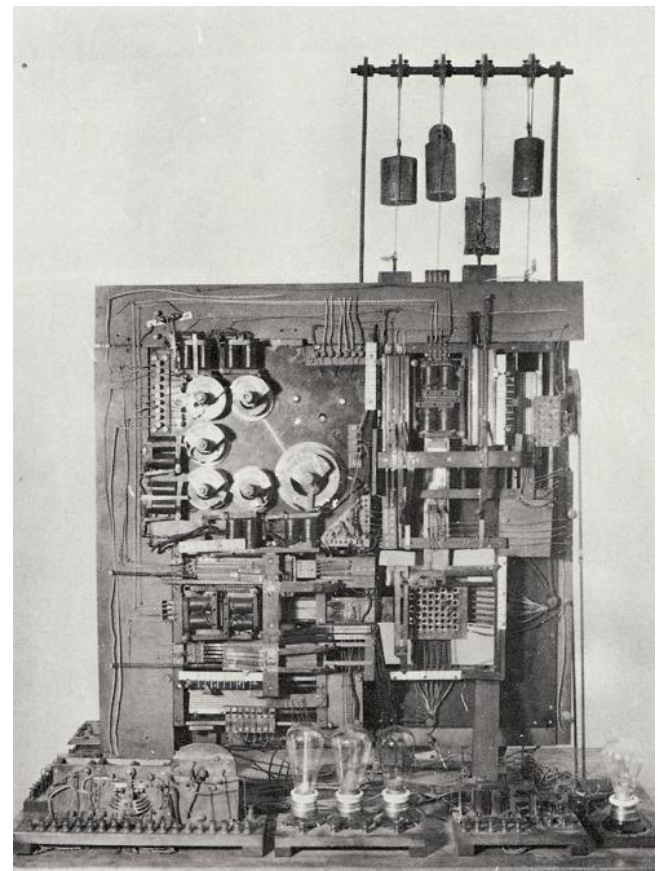
Johannes de Koning



Jonathan Schaeffer

"The winner was the program Chess Machine Schroeder, programmed by Ed Schroeder, scoring 4 wins and a draw in 5 games. Schroeder, perhaps best known as the author of the Rebel program, narrowly lost the 1986 World Championship when his program overheated in the last round. This time luck was on his side. He was lost in 3 of his games, including a comeback win in the 4th round against Richard Lang and Ossi Weiner's Chess Genius (two pawns down in a rook and minor piece endgame!). Second place was shared between Zugzwang (University of Paderborn) and Cumulus (J.C Weil) each with 4 points. Zugzwang should probably have won the tournament, drawing its last 2 games in easily winning positions. The tournament was notable for the absence of a number of well-known programs such as Deep Thought, Cray Blitz and Bebe."

El Ajedrecista by Leonardo Torres y Quevedo
"The first computer game"



WCCC #8, Hong Kong, 1995

Program	#	Authors	Hardware
Fritz	4	Frans Morsch, Mathias Feist, Cock de Gorter	Pentium 90 MHz
Star Socrates	4	Don Dailey, Chris Joerg, Bradley Kuszmaul, et al.	1824 node (2 x i860) Intel Paragon
Deep Blue Prototype	3½	Feng-hsiung Hsu, Murray Campbell, Joe Hoane	IBM RS/6000 and 14 chess engine processors
Frenchess	3½	Marc-François Baudot, Jean-Christophe Weill, Jean-Luc Seret, Michel Gondran	Cray T3D 128 DEC Alpha 21064
Junior	3½	Amir Ban, Shay Bushinsky	Pentium 90 MHz
WChess	3	David Kittinger, James Parker	Pentium 120 MHz
Chess Genius	3	Richard Lang	Pentium 90 MHz
HiTech	3	Hans Berliner, Chris McConnell	Sun-4, special purpose hardware
Rebel	3	Ed Schröder	Pentium 90 MHz
Zugzwang	3	Rainer Feldmann, Peter Mysliwietz	GC-Powerplus, 96 x PowerPC 601
Schach 3.0	2½	Matthias Engelbach, Thomas Kreitmair	Pentium 90 MHz
Cheiron	2½	Ulf Lorenz	Pentium 90 MHz
Virtua Chess	2½	Marc-François Baudot, Jean-Christophe Weill	Pentium 90 MHz
DarkThought	2	Ernst A. Heinz, Peter Gillgasch, Markus Gille	DEC Alpha
SOS	2	Rudolf Huber	Pentium 90 MHz
Ferret	2	Bruce Moreland	Pentium 90 MHz
Zeus 3.0	2	Gerardo Castaño Recio	Pentium 90 MHz
Pandix	2	Gyula Horváth, Zsuzsa Horváth, Csaba Szűts	Pentium 90 MHz
Phoenix	2	Jonathan Schaeffer	HP 9000/720
Ulysses	2	Ulf Lorenz, Valentin Rottmann	SPARCstation 10 60MHz
Nightmare	1½	Reinhold Gellner, Gaby von Rekowski	Pentium 90 MHz
Gandalf	1½	Steen Suurballe	Pentium 90 MHz
LChess	1	Lex Loep	Pentium 90 MHz
Woodpusher	1	John Hamlen	Pentium 90 MHz

WCCC #8



Playoff: Star Socrates - Fritz
Left: Chris Joerg (?), Don Dailey
Right: Frans Morsch, Mathias Feist

John Hamlen



1996, 1997: Deep Blue



Joe Hoane, Feng-hsiung Hsu, Murray Campbell

Feng-hsiung Hsu



Murray Campbell (1)

My Computer Chess Journey



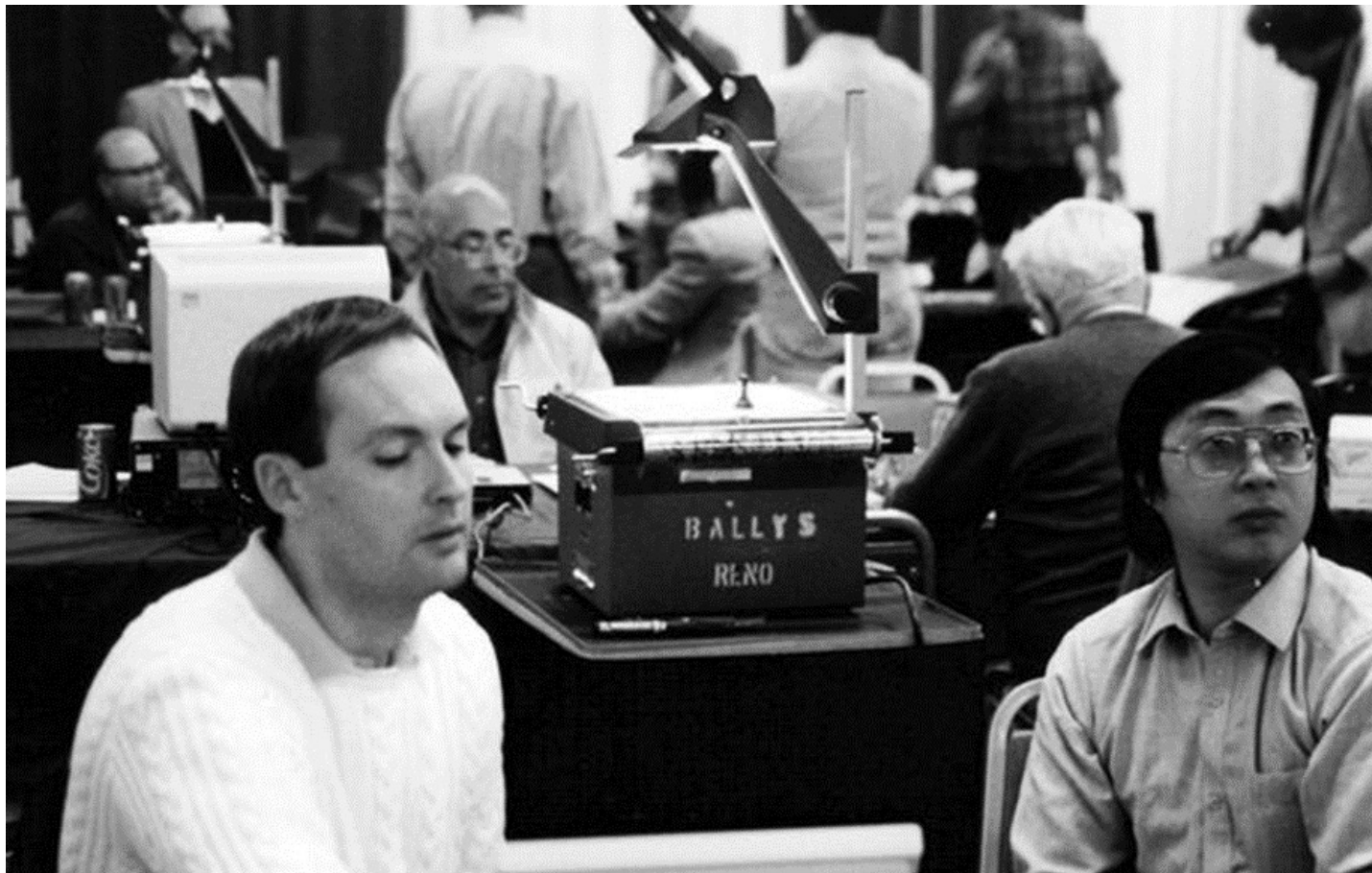
Murray Campbell (2)



Murray Campbell (3)



Murray Campbell (4)



Murray Campbell (5)

First years at IBM Research

Aug. 1989

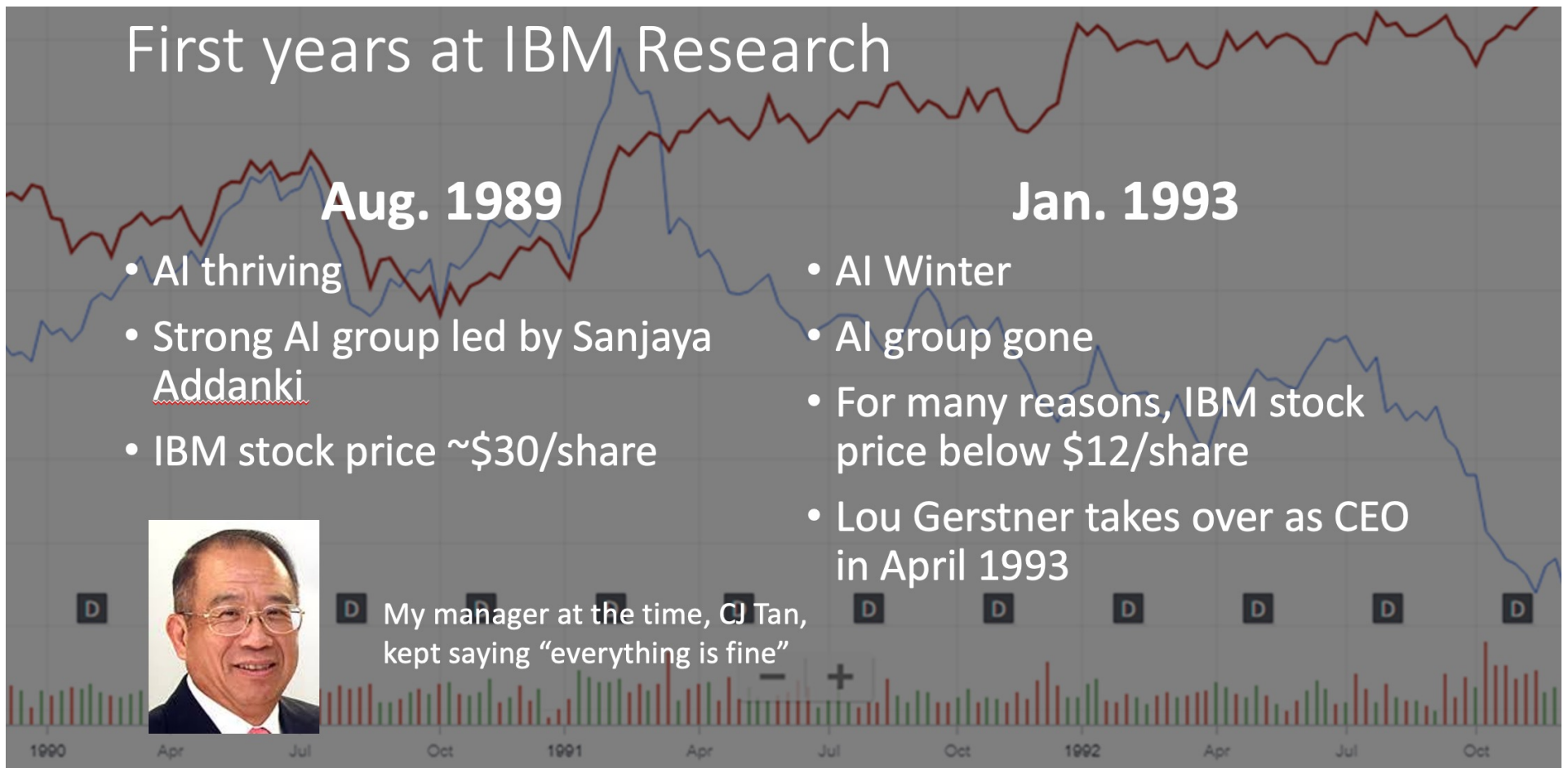
- AI thriving
- Strong AI group led by Sanjaya Addanki
- IBM stock price ~\$30/share

Jan. 1993

- AI Winter
- AI group gone
- For many reasons, IBM stock price below \$12/share
- Lou Gerstner takes over as CEO in April 1993



My manager at the time, CJ Tan, kept saying "everything is fine"



Murray Campbell (6)



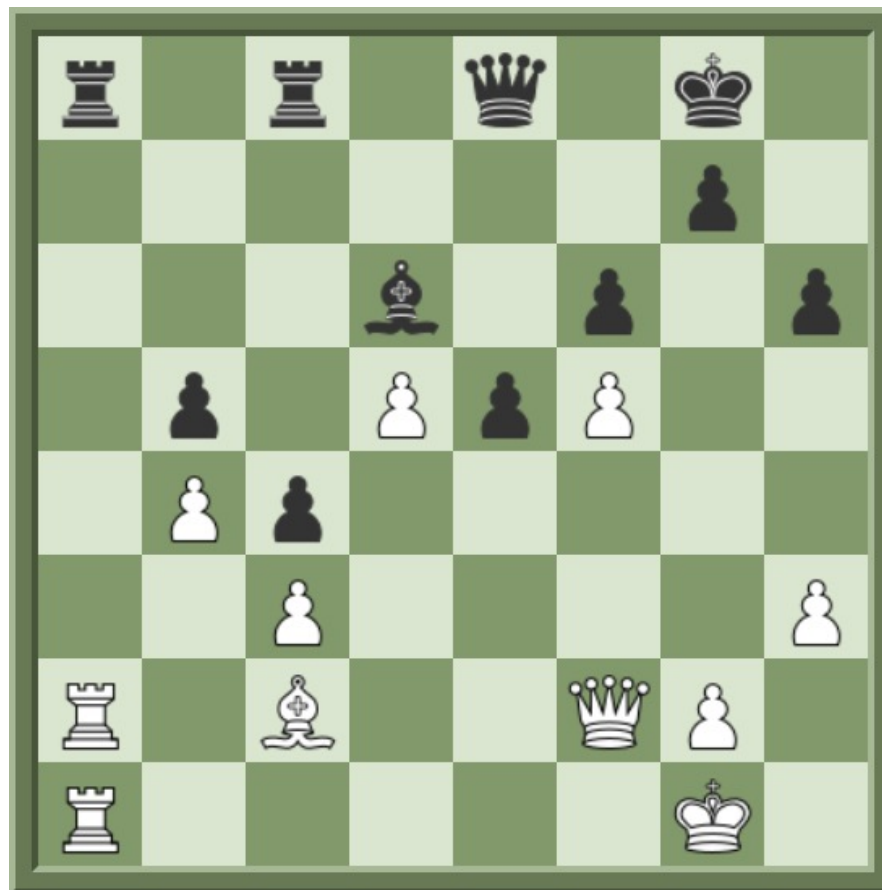
Getting Ready for 1996 Kasparov-Deep Blue Match

Murray Campbell (7)



Murray Campbell (8)

Deep Blue – Garry Kasparov, Game 2, 1997



White to move

Murray Campbell (8)

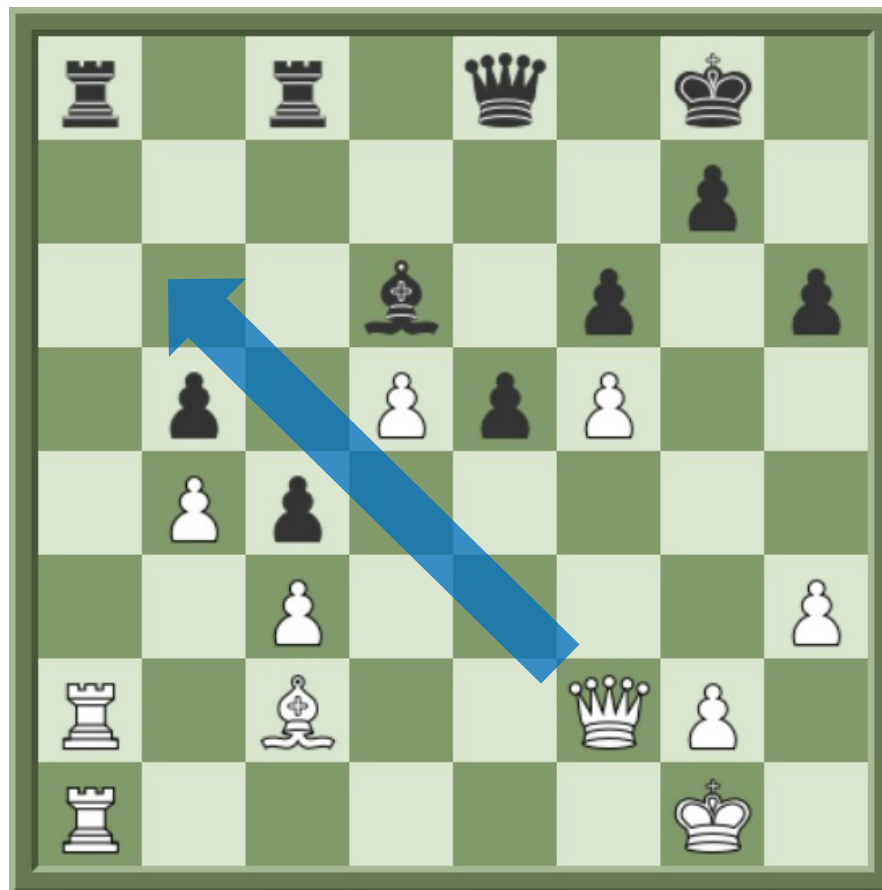
Deep Blue – Garry Kasparov, Game 2, 1997



White to move

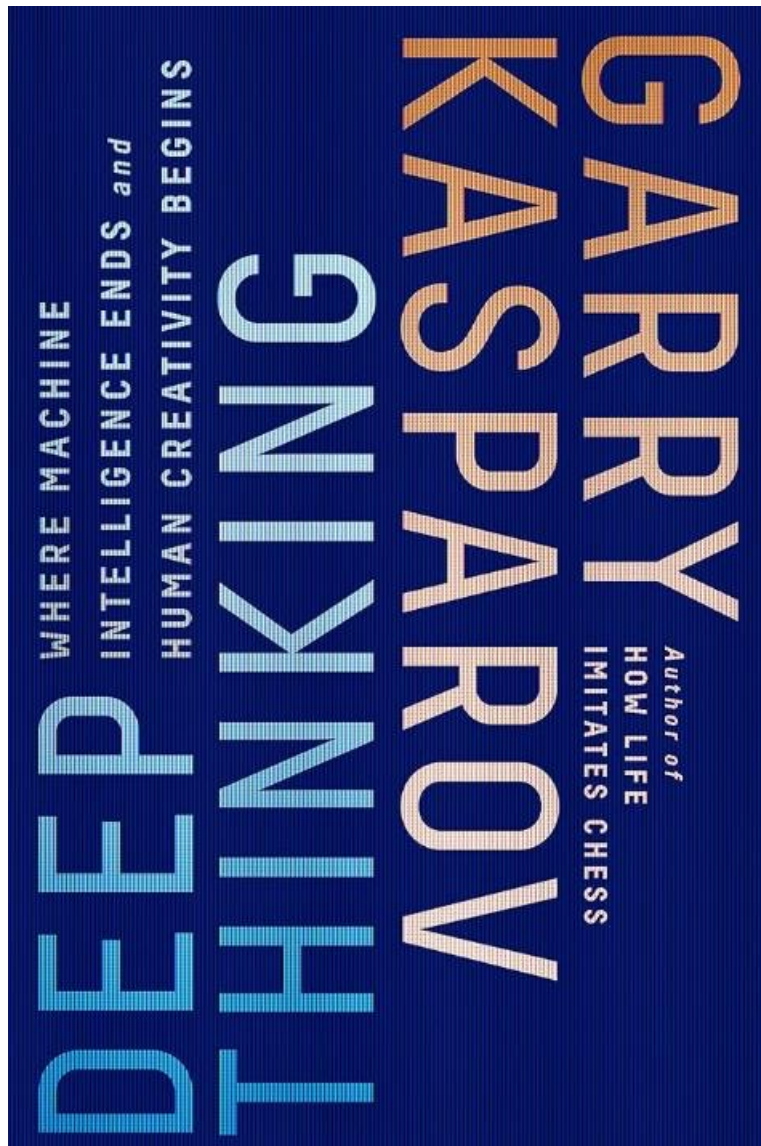
Murray Campbell (8)

Deep Blue – Garry Kasparov, Game 2, 1997



White to move

Murray Campbell (9)



“I have been asked, ‘Did Deep Blue cheat?’ more times than I could possibly count ... After twenty years of soul-searching, revelations, and analysis, my answer is now ‘no.’” -- Garry Kasparov, 2017

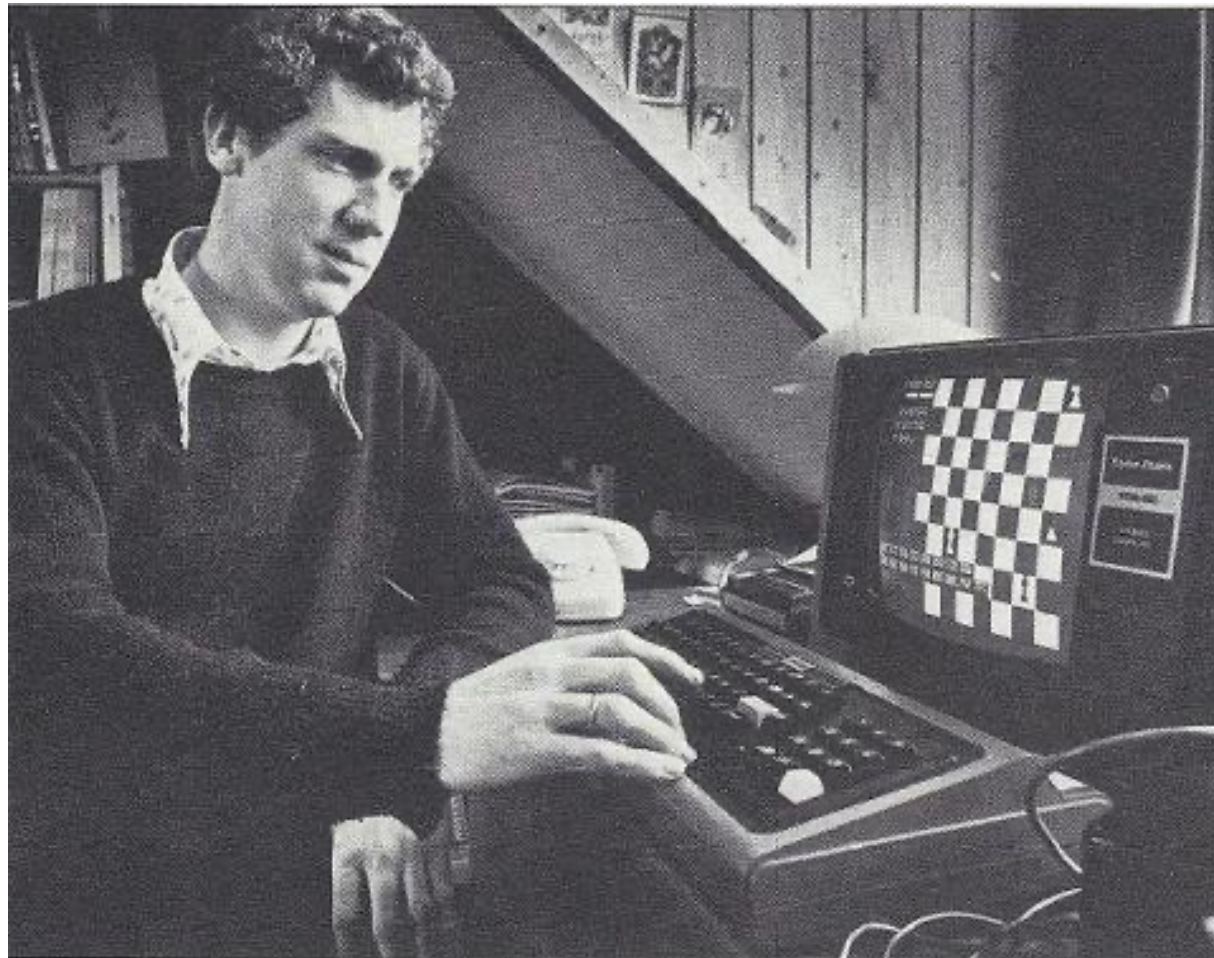
9th-28th WCCC, 1999-2024

#	Year	Location	N	Winner	Authors
9 th	1999	Paderborn, Germany	30	Shredder	Stefan Meyer-Kahlen
10 th	2002	The Netherlands	18	Junior	Amir Ban, Shay Bushinski
11 th	2003	Graz, Austria	16	Shredder	Stefan Meyer-Kahlen
12 th	2004	Ramat-Gan, Israel	14	Junior	Amir Ban, Shay Bushinski
13 th	2005	Reykjavík, Iceland	12	Zappa	Anthony Cozzie
14 th	2006	Turin, Italy	18	Junior	Amir Ban, Shay Bushinski
15 th	2007	Amsterdam, The Netherlands	11	Zappa	Anthony Cozzie
16 th	2008	Beijing, China	9	HIARCS	Mark Uniake
17 th	2009	Pamplona, Spain	9	Junior, Shredder, Deep Sjeng	Amir Ban, Shay Bushinski; Stefan Meyer-Kahlen; Gian-Carlo Pascutto
18 th	2010	Kanazawa, Japan	9	Rondo, Thinker	Zach Wegner; Lance Perkins, Kerwin Medina
19 th	2011	Tilburg, The Netherlands	9	Junior	Amir Ban, Shay Bushinski
20 th	2013	Yokohama, Japan	6	Junior	Amir Ban, Shay Bushinski
21 st	2015	Leiden, The Netherlands	9	Jonny	Johannes Zwanzger
22 nd	2016	Leiden, The Netherlands	6	Komodo	Mark Lefler, Don Dailey, Larry Kaufman
23 rd	2017	Leiden, The Netherlands	4	Komodo	Mark Lefler, Don Dailey, Larry Kaufman
24 th	2018	Stockholm, Sweden	8	Komodo	Mark Lefler, Don Dailey, Larry Kaufman
25 th	2019	Macau, China	6	Komodo	Mark Lefler, Don Dailey, Larry Kaufman
26 th	2022	Vienna, Austria	5	Dragon by Komodo Chess	Mark Lefler, Don Dailey, Larry Kaufman
27 th	2023	Valencia, Spain	4	Stoofvlees	Gian-Carlo Pascutto
28 th	2024	Santiago de Compostela, Spain	9	????	????

World Microcomputer Championships

#	Year	Location	Champion	Authors
1st	1980	London, United Kingdom	Chess Challenger	Dan Spracklen, Kathe Spracklen, Ron Nelson
2nd	1981	Travemünde, West Germany	Fidelity X	Dan Spracklen, Kathe Spracklen
3rd	1983	Budapest, Hungary	Elite Auto Sensory	Dan Spracklen, Kathe Spracklen
4th	1984	Glasgow, United Kingdom	Psion	Richard Lang
5th	1985	Amsterdam, The Netherlands	Mephisto	Richard Lang
6th	1986	Dallas, USA	Mephisto	Richard Lang
7th	1987	Rome, Italy	Mephisto	Richard Lang
8th	1988	Almeria, Spain	Mephisto	Richard Lang
9th	1989	Portorož, Slovenia	Mephisto	Richard Lang
10th	1990	Lyon, France	Mephisto	Richard Lang
11th	1991	Vancouver, Canada	Mephisto	Richard Lang
12th	1993	Munich, Germany	Mephisto	Richard Lang
13th	1995	Paderborn, Germany	MChess	Marty Hirsch
14th	1996	Jakarta, Indonesia	Shredder	Stefan Meyer-Kahlen
15th	1997	Paris, France	Junior	Amir Ban, Shay Bushinski
16th	1999	Paderborn, Germany	Shredder	Stefan Meyer-Kahlen
17th	2000	London, United Kingdom	Shredder	Stefan Meyer-Kahlen
18th	2001	Maastricht, The Netherlands	Deep Junior	Amir Ban, Shay Bushinski

Jaap van den Herik



Jaap van den Herik (1)



The Power of DEEP



Congratulations to Geoffrey Hinton and Demis Hassabis

Geoffrey: Thank you for Deep Learning.

Demis: Thank you for your participation in the Computer Olympiad 2000 (London, Alexandra Palace), for DeepMind, and, of course, for generously sponsoring the WCCCs and CHESS.

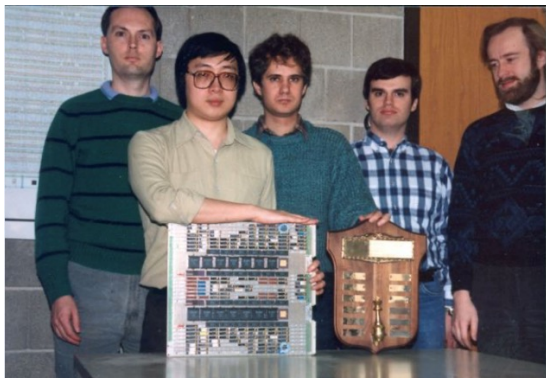
Jaap van den Herik (2)

"Deep" played a key role in the development of computer chess program development

Deep Thought → Deep Blue →

Deep Fritz → Deep Junior →

Deep Learning → DeepMind



Murray Campbell, Feng-hsiung Hsu, Thomas Anantharaman, Mike Browne, and Andreas Nowatzyk



Chung-Jen Tan (team manager), Gerry Brody, Joel Benjamin, Murray Campbell, Joseph Hoane, and Feng-Hsiung Hsu (seated)

Jaap van den Herik (3)

2002 Deep Fritz – Kramnik, Bahrein

4-4



2003 Deep Junior – Kasparov, New York

3-3

2006 Deep Fritz – Kramnik, Bonn

4-2



Jaap van den Herik (4)

Deep Learning

Essentially, Deep Learning can learn from its own errors while Machine Learning needs a human to intervene.

Deep Learning also requires much more data than Machine Learning, which in turn requires significantly more computational power.

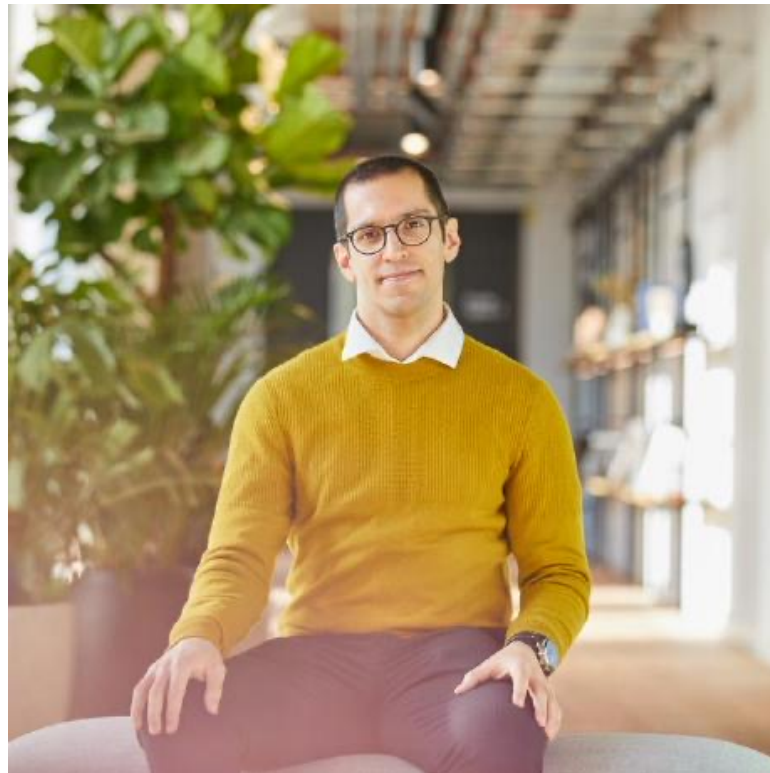
Paradigm shift from hand-made to automated evaluation functions.

Jaap van den Herik (5)

From Machine Learning to Solution	(2000 – 2035)
To: Machine Learning	(2000 – 2020)
To: Adaptation	(2005)
To: Automatic Adaptation (Monte Carlo Tree Search)	(2005 – 2015)
To: Autonomy	(2015 – 2020)
To: Deep Learning	(2015 – 2020)
To: Explainable AI	(2020)
To: Interpretable AI	(2022)
To: Solution (prediction)	(2035)

2017: AlphaZero

Nenad Tomasev, DeepMind



David Levy

My Fifty Years of Computer Chess



Panel Discussion

The Fifty-Year Computer Chess Experiment.
What Are the Outcomes?

Moderator: Jaap van den Herik

Panelists: 1974 WCCC participants

Vladimir Arlazarov

Don Beal

David Levy

Monty Newborn

In Memoriam



Ben
Mittman



Bernard
Swets



Mikhail
Donskoy



Georgy
Adelson-Velsky



Mike
Valvo

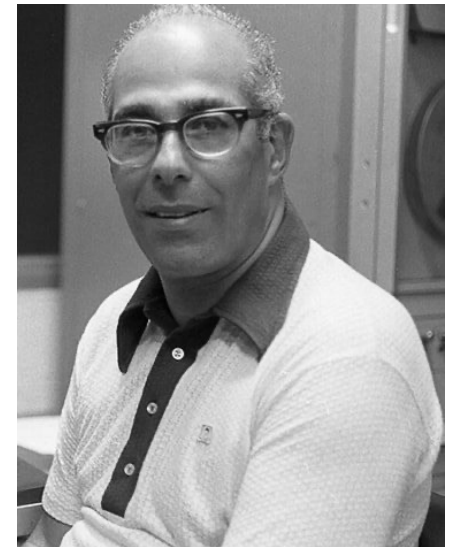
Don Dailey



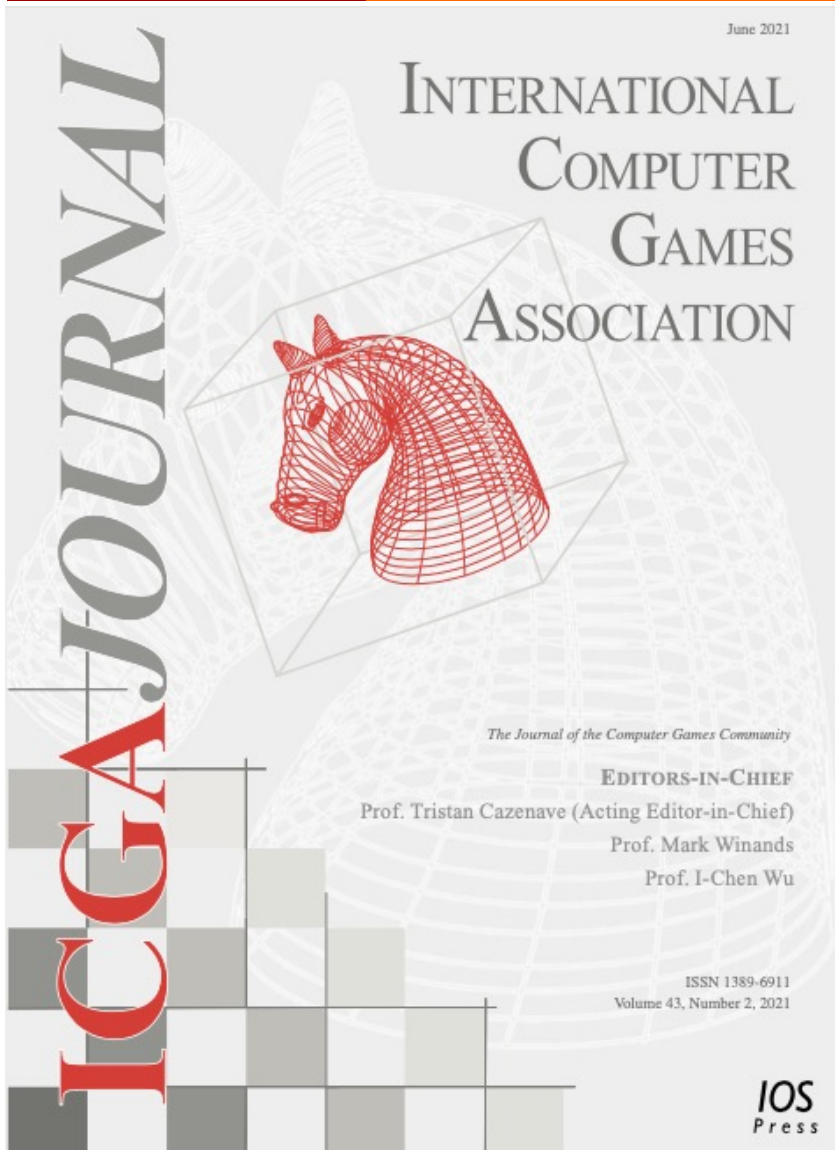
Tony Scherzer



Hans Berliner



ICGA Journal



- ➔ Started as the ICCA Newsletter In 1980, becoming the ICCA Journal, and then the ICGA Journal
- ➔ Published by IOS Press
- ➔ Indexed by major citation agencies

ICGA Membership

- Publish
 - Advances in Computer Games conference
 - Computers and Games conference
 - ICGA Journal
- Compete
 - World Computer Chess Championship
 - Computer Olympiad
- \$20 US per year
- icga.org

Thank You

Thank you to the pioneers who travelled from far and wide to be with us today

Thank you to the pioneers who joined us online

Thank you to everyone who attended in person and online for helping make this a success

Google DeepMind

