The 1970 United States Computer Chess Championship: The Start of the Longest-Running Experiment in Computer Science History

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Abstract

On August 31, 1970, an experiment began that continues to this day. The first chess tournament for computers was held as part of the Association for Computing Machinery's (ACM's) National Conference. The interest generated was tremendous, leading to ACM sponsoring an annual event until 1994. Chess competitions continue to this day, allowing for 50 years of data on the growth of artificial intelligence capabilities in this domain. During this period, program ratings have soared from roughly 1400 in 1970 to over 3500 today. The 1970 event was the first continuous competition in computer science history, and it represents the longest ongoing experiment in computer science history.[1]

Introduction

Creating a program capable of competing with the human world chess champion was one of the first "grand challenge" problems of the fledgling research area of artificial intelligence. The importance of computer chess at the dawn of the computer age is reflected in the many computer science luminaries that contributed to the early advances in the field. This includes Claude Shannon (father of information theory), Alan Turning (creator of the Turing Machine and the Turing Test), Herbert Simon (Nobel Laureate and winner of the prestigious Turing Award), Alan Newell (Turing Award winner), and John McCarthy (Turing Award winner).

In the 1950s and the 1960s, progress in developing chess programs was slow. However a breakthrough occurred with the development of MACHACK VI by Massachusetts Institute of Technology (MIT) student Richard Greenblatt. In 1967 the program defeated a 1500 rated player and even won the Class D prize at a local tournament. This represented a huge increase in performance, to the level of that of a local club player.

MACHACK's tournament career was short. Greenblatt summarized it by writing that [Van den Herik and Greenblatt, 1992],

> *MACHACK went on to play in about half a dozen human chess tournaments. Its best results were drawing an 1880 player and beating a 1720 player. Its best performance rating in a tournament was 1820 and I believe its official [United States Chess Federation] rating was 1523.*

In recognition of the program's trailblazing success, it was made an honorary member of the United States Chess Federation (USCF).

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[1] Some paragraphs of the text have been taken from *Man vs. Machine: Challenging Human Supremacy at Chess* by Karsten Müller and Jonathan Schaeffer [2018].

Tony Marsland, a graduate student at the University of Washington, enjoyed playing chess and this interest motivated him to write a chess program. After graduating in 1967, he spent one year as an Assistant Professor before going to work for Bell Telephone Labs in New Jersey where he continued tinkering with his program in his spare time. In 1970, he came up with an idea for helping to popularize computer chess research at the upcoming Association for Computing Machinery (ACM) conference [Marsland, 2007]:

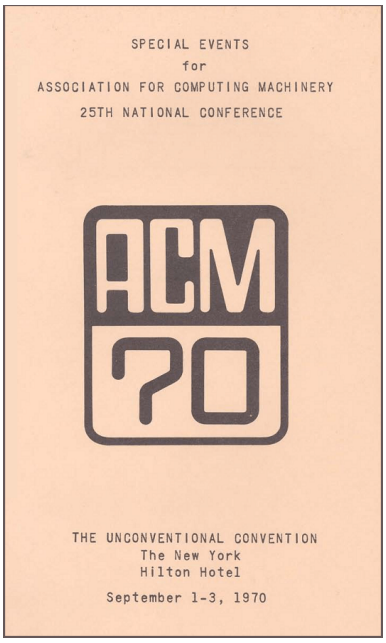
> *... I wrote to Monty Newborn, who was working at Columbia University in Manhattan and was an organizer for the upcoming ACM...Computer Conference, suggesting that we provide some kind of a Computer Chess Exhibit. I had in mind a demonstration of computer vs. human play. Instead, Monty came up with a better idea of a computer chess tournament and we met with Keith Gorlen and David Slate (Northwestern University)... and hammered out a proposal that Monty took to the ACM for their blessing...*

And so was born the United States Computer Chess Championship. This event was meant to generate publicity for computer chess, help foster and support research in this area, facilitate the exchange of ideas, and benchmark the progress of developing strong chess-playing programs. Monty Newborn and Kenneth King, both from Columbia University, organized the event. Jacques Dutka, a former chess master, was the tournament director.[2]

The 1st United States Computer Chess Championship

The tournament attracted six entrants. Of interest in the lineup was Hans Berliner, then a Ph.D. student at Carnegie Mellon University. He was a strong over-the-board chess master, and was the World Correspondence Chess Champion from 1965-1968. In 1956 he won the Eastern States Open, ahead of a promising junior player named Bobby Fischer. Berliner was the first strong chess player to write a chess program, J. BIIT (Just Because It Is There). It was the first program he had ever written!

[2] Dutka soon became famous for his 1971 paper in which he announced the calculation of the square root of 2 to one million digits. That may not sound like much of a computation today, but you have to recall he was using 1970-era computers.



ACM's National Conference, 1970. [Computer History Museum, 1970]

MACHACK was noticeably and regrettably absent from the lineup. Greenblatt explains why his program did not participate [Van den Herik and Greenblatt, 1992]:

> *Basically I was not particularly excited by the idea of computer-vs-computer chess. That plus the fact that I was busy at that time I think are the two reasons. I felt then and I still feel now to a great extent that it is better for the field if anybody can go to the local tournament and play any time when ready. The whole thing, where there is an event once a year, and you come in and play 4 or 5 games, is not a particularly positive situation. But on the other hand I also understand that from the point of view of sponsorship and people's interest and so forth, maybe that helps promote the game and promote computer chess.*

Rules of the Tournament

1. A three round Swiss tournament is planned.

2. Game clocks are started at 5:30 PM each evening.

3. Unless otherwise specified below, rules of play will be identical to those of regular "human" tournament play. If a point is in question, the tournament director has the authority to make a decision.

4. Games will be played at a speed of 40 moves per player in the first two hours and then 10 moves every 30 minutes thereafter.

5. The tournament director may adjudicate a game after 40 moves or after five hours of total elapsed time.

6. If a participant encounters a technical difficulty (machine failure, communications failure or error, or program failure) during the course of a game, the tournament director will allow him to stop his clock for as long as necessary, but not to exceed 20 minutes, in order to restore his system. At the end of the 20 minutes, his clock will be started again. The tournament director will grant a participant permission to stop his clock at most three times during the course of a game.

7. There is no adjustment of program parameters during the course of a game.

8. At the end of each game, each participant must turn in a game record along with a record of his accumulated cpu time.

9. Each participant will be provided with a telephone. The line charges portion of the phone bill must be paid by each participant.

1st U.S. Computer Chess Championship rules. [Computer History Museum, 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 Edmenton, 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 Carneige-Mellon Computer Center Carneige-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/I 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/I computer

Participants, as listed in the ACM conference program [Computer History Museum, 1970]. Note the program authors differ slightly from those listed in the final results of the event.

Five entries were from various places in the United States: CHESS 3.0, COKO III, DALY CP, J. BITT, and SCHACH. From Canada, there was the MARSLAND CP. Most of these machines were located far away from New York City [Berliner, 1970b]:

> *Three of the computers were directly connected by telephone lines to input/output terminals in the New York Hilton Hotel. Here the operators of the programs typed in the moves made by the opponent computer, and in due time the computer would type back*

its reply. Two other computers were connected by voice telephone so that the operator at the computer site merely had to say the move made by the computer into the telephone for it to be actually played in New York. The sixth competitor was a mini-computer, so called because of its size and cost. This computer was located at the tournament site and had a television-type display on which the current position was shown. When the computer made a move the display changed. When its opponent made a move, this was communicated to the computer by means of a "light pen" with which the operator touched the piece that is moving and then the square to which it is going.

Chris Daly running the DALY CP installed on the IDIOM mini-computer.
(Note the use of a light pen – in 1970!)

Games were played at the pace of 40 moves in two hours, the same time controls typically used in human play. Special timeout previsions were made for hardware/software/communication glitches.

The first game to finish achieved one of the tournament's goals immediately – publicity. Programming errors resulted in the MARSLAND CP quickly succumbing to J. BIIT [Marsland, 2007]:

The first ACM ...Computer Chess Championship took place in New York. Meanwhile I was busy driving across the continent (probably I was in North Dakota when the first round started). However, I had arranged with my local sponsors [to have someone operate the program for me]. I am sure he would have had a happier time had [the MARSLAND CP] performed better, but at least we recognized the value to the advertising world of a New York Times *headline like "Computer Loses in King-sized Blunder"![3] Any mention of computer chess in the [*New York Times*] was better than none, I guess.*

The participants quickly realized another goal: the exchange of ideas. David Levy, who started in 1971 to be the guest commentator at the ACM events, observed this first hand [Levy, 2005]:

And one of the things that was very noticeable to me very quickly was the friendly atmosphere at the tournaments, in which the programmers would chat to each other while

[3] The actual title is "Chess Computer Loses Game in a King-Size Blunder" [Devlin, 1970].

the games were in progress and between rounds. And they would get ideas from each other. So that after each tournament, the programmers would go away not only with more knowledge about their own programs, but with knowledge about how other people were doing things. And this, in my view, was the main factor in increasing the strength of programs steadily year on year. It was just an acquisition of important knowledge by most of the people in the field. So I think the importance of these tournaments cannot be underestimated in the whole history of the progress of computer chess.

At the New York Hilton Hotel, participants and spectators watch progress of three games being run simultaneously during computer chess championship

CHESS 3.0 - COKO III. [Devlin, 1970]
Left to right: Jacques Dutka, unknown,
Keith Gorlen (CHESS 3.0), Monty Newborn, Steven M. Bellovin,[4] unknown.

The tournament was won by CHESS 3.0, developed by a team of students at Northwestern University. The program's win was decisive, not only by winning all three of its games but, more importantly, the quality of its play was noticeably above that of the other entries.

Program	Authors	Score
CHESS 3.0	Ben Mittman, Larry Atkin, Keith Gorlen, David Slate	3-0
DALY CP	Chris Daly, Ken King	2-1
COKO III	Dennis Cooper, Ed Kozdrowicki	1½ -1½

[4] Steven Bellovin was an undergraduate student at Columbia University and helped out with the tournament. Today, he is the Percy K. and Vida L.W. Hudson Professor of Computer Science at Columbia University. He is credited with being one of the founders of Usenet (along with Tom Truscott, another computer chess pioneer). He is a member of the Cybersecurity Hall of Fame.

J. BIIT	Hans Berliner	1½-1½
SCHACH	Franklin Ceruti, Rolf Smith	1-2
MARSLAND CP	Tony Marsland	0-3

1970 U.S. Computer Chess Championship result.

In 1968 undergraduate students Larry Atkin and Keith Gorlen wrote a chess program. Physics graduate student and 2050 USCF rated player David Slate heard of this initiative and wrote his own program. In 1969, the two teams joined forces with the resulting effort named CHESS 2.0. In 1970 Gorlen left Northwestern University and the CHESS team (although he stayed in touch and occasionally made contributions). Atkin's and Slate's version CHESS 3.0 entered the ACM event.

The Northwestern University program, often called CHESS X.Y to avoid having to remember their numbering scheme, was to dominate the first decade of computer chess tournaments. It is remarkable how consistently well their program played over the first 10 ACM championships (1970-1979). Given the small number of games in each event, the closeness of the competition in terms of playing strength, the presence of programming bugs, and unreliability of computing hardware, their dominance is a testament to Atkin's and Slate's innovative ideas, careful programming, and attention to detail. Slate and Atkin [1977] succinctly capture the frustration they felt in developing their programs in the 1970s: "The lack of programming tools has plagued the whole field of computer chess. With the proper tool one might accomplish in a day a job that had been put off for years." The truth is that over 40 years later, their comment is still valid!

CHESS 3.0 wins the 1st U.S. Computer Chess Championship, 1970.
Left to right: Monroe Newborn (Columbia), Larry Matsa (ACM), David Slate (CHESS 3.0), Larry Atkin (CHESS 3.0), and Ben Mittman (CHESS 3.0).
Courtesy of Monroe Newborn.

Environment

Monty Newborn, who co-organized the event, described the tournament environment [Newborn, 1975]:

> *At 5:30 each evening the games were scheduled to begin, but more typically they began around 6 P.M. It was a rare event throughout the tournament when all three games were simultaneously in progress. Almost always at least one computer was having difficulties. However, in general, the better programs were more reliable, and in turn the better games*

had fewer interruptions. Each evening there were several hundred spectators in attendance, including computer specialists and chess experts. The most notable chess experts were [Grandmaster] Pal Benko one of the top players in the United States, who seemed somewhat unsure of the future potential of computers in the chess world, and [International Master] Al Horowitz former chess editor of The New York Times*, a long-time skeptic regarding their potential.*

Throughout the tournament there was a most casual and informal atmosphere... . Good moves were met with cheers from the audience; bad moved were hissed. The programmers discussed moves they expected their computers to make, reporters interviewed the participants, and Berliner ate his sandwiches. Berliner, an old pro of the human chess tournament circuit, came well stocked with food each evening.

Part of the lure of the event was the entertainment value. The programs played at a weak level and had numerous idiosyncrasies that surprised and delighted the audience. Ben Mittman described a 3rd round encounter where COKO III "finally managed to eke out a draw against J. BIIT while the audience howled in laughter as the final blunders...were played on the display board" [Mittman, 1976].

As an historical footnote, as pointed out in *The New York Times* [Devlin, 1970]:

By chance the tournament fell on the 200th anniversary of the appearance of the world's first chess automaton, called the TURK. Introduced in the Royal Palace in Vienna by its inventor, Baron Wolfgang von Kempelen, it defeated almost all comers — including Napoleon —and baffled some of the best minds in Europe. The automaton was the figure of a Turk seated at a cabinet on which was a chess board. Actually the TURK was operated by a man hidden by an ingenious set of false panels.

Now, finally, after two centuries, the mechanical TURK had been superseded by an electrical one.

The Competitors

Fifty years of research, development, and testing has shown a path to success at building a super-human chess-playing program. But at the time of the first tournament, many of the fundamental ideas that we take for granted today had either not been invented yet, or their potential had not been realized. For example, experiments in the automatic tuning of evaluation functions was done by Arthur Samuel in his checkers research, but his ideas were ahead of his time [Samuel, 1959; Samuel, 1967]. Transposition tables were used in MACHACK, but circa 1970 limited machine memory meant they were not used. Iterative deepening for chess programs had yet to be invented. Even more fundamental was the search strategy. There was tension between whether Claude Shannon's Type A approach – brute force, exploiting the strengths of the computer – or his Type B approach, selective – trying to emulate human problem solving – was the right way forward.

Little has been published about the technical details of the participating programs. The best sources are Monty Newborn's book *Computer Chess* [Newborn, 1975] and a panel discussion of program authors at the 1971 ACM chess tournament [Mittman, 1971].

CHESS 3.0 used alpha-beta search (the algorithm was less than a decade old). As was typical for programs of that day, as the search moved down the tree the number of moves at each depth

grew smaller (only the top-ranked moves were considered). This was a matter of practicality. The program is "...based on a simple design which performs a depth-first search to a fixed number of plies 'D'. The same evaluation function which scores the end points of the branches of the tree also is used to select the 'L_i' best moves to be searched at each level *i*, where L_i is a fixed number for each *i*. There are many deficiencies in this still primitive design which show up glaringly in practice. ... The L_i 'best-valued' moves [are supplemented] with all checks, all captures, and those moves having a 'tactical potential' significantly above the background, average 'tactical potential' for all the moves" [Mittman, 1971]. On a top-of-the line Control Data Corporation (CDC) computer, the program was only able to search roughly 50 positions per second. The program was supplemented with a small opening book.

The DALY CHESS PROGRAM (DALY CP) ran on what is a virtually unknown machine today: an IDIOM computer built by a small New York company. Alpha-beta searched to depth 4 were tried, with material and mobility being the only heuristics in the evaluation function. Using only 4K of memory, the program didn't have room for much else!

Unlike most of the other programs, components of the COKO III program had been published before the tournament, including the tree search algorithm [Kozdrowicki, 1968] and the checkmate subsystem [Baylor and Simon, 1966]. The program included specialized routines that allowed the program to selectively search interesting tactical moves. At the root of the search, COKO considered only a handful of moves – typically 4-8. Thus, there was considerable onus on the program's knowledge to identify the strong moves. "COKO III does <u>not</u> use the famous alpha-beta procedure. Although the alpha-beta procedure is a great time saving method, it is unclear at this stage of program development what the full significance of applying such a method to a tactical-strategical game tree would be. ... COKO III contains over 50 specific chess algorithms..." [Mittman, 1971].

At the age of 40, Hans Berliner returned to school to pursue a Ph.D. at Carnegie Mellon University. J. BIIT grew out of his early research into computer chess, eventually leading to his degree in 1974. Being an International Master, he used his expertise to construct a knowledge-based program that would build small search trees. Berliner claims an average of 30 nodes in the tree, where a node can also contain search components. The program searched a minimum of two ply, but with quiescence search could reach a hard limit of 14 ply. The program also included an opening book. A paper describing his program appeared shortly after the ACM tournament]Berliner, 1970a].

The SCHACH program began when Rolf Smith and Franklin Cerutti were graduate students at Texas A&M University. Smith published an early description of his program [Smith, 1967]. The program built a small search tree. "The backbone of SCHACH is the concept of piece board control, defined as all squares on which a piece exerts direct or indirect influence (can move to in a capture mode). Utilizing this concept we have found that a pseudo-dynamic position projection can be effected in a static environment on a local scale. ... Coupled with a heuristic method developed for examination of multiple piece exchanges (SWAP), it is theoretically possible to predict/project move sequences up to 36 plies in depth with substantial accuracy. This is used in lieu of alpha-beta pruning or dynamic move-generation ordering, permitting pre-pruning of

move-group subsets prior to recursive evaluation and deeper ply explorations" [Mittman, 1971]. Unfortunately, the program experienced a number of bugs that affected its performance.

The MARSLAND CP was developed when Tony Marsland was a graduate student at the University of Washington. Upon graduation, he went to work at Bell Telephone Labs and interacted with Ken Thompson, who was soon to compete with his own chess program. The program used a three-ply selective search with alpha-beta. Of great historical interest is that the code has been preserved and is available online [Marsland, 1970].

It is interesting to note the programming languages used by the competing programs: two were written in assembly language, one in PL/1, one in Algol, and two in FORTRAN. For that time, FORTRAN was the *de facto* portable language, allowing both COKO III and SCHACH to run on different machine architectures. However this came with an implementation cost; recursion was not available in FORTRAN.

Aftermath

The championship attracted important media attention, including coverage in *The Times* (London), *The New York Times*, and the *Washington Post*. All this helped convince ACM that the event was a success and worthy of being repeated. Thus began a 25-year relationship between computer chess and ACM.

The championship was a novelty for that time and was reported in numerous technical venues. ACM's SIGART, the Special Interest Group for ARTificial intelligence, gave a trivial summary of the event. However, over time SIGART devoted numerous articles to the increased interest in computer chess that the tournament generated. Further, several of the competitors turned their research into computer chess into academic publications. Each article helped raise the profile of chess as a worthy application for AI research.

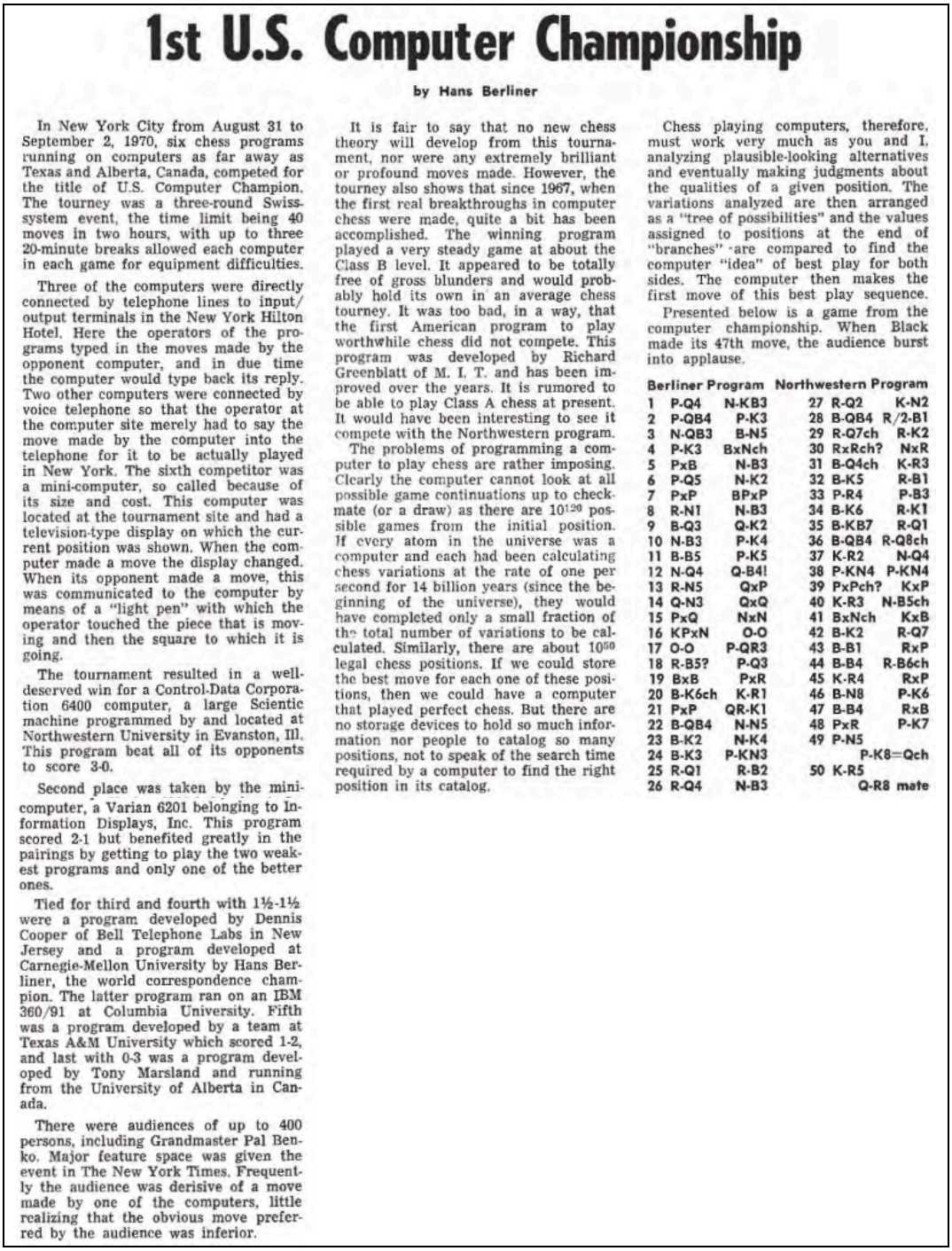
FIRST U.S. COMPUTER CHESS TOURNAMENT

A program wirtten by Ben Mittman (Northwestern University), Keith Gorland (Bell Telephone Labs), Larry Atkin (CDC), and David State (CDC), was the winner of the computer chess tournament conducted at the ACM National Conference in New York City, September 1-2, 1970. Their program written in FORTRAN IV and COMPASS was run on the CDC 6400 computer. Kenneth L. King (Information Displays, Inc.) and Chris Daly (NASA) was second on a Varian 620/I computer.

The tournament director, Dr. Jacques Dutka, said that there is talk of another such tournament at the ACM meeting in Chicago next year.

First AI publication on the 1970 tournament in SIGART. [Bledsoe, 1970]
The significance of the event is understated. Note the misspelling of Gorlen's name.

Hans Berliner was particularly prolific in writing popular and technical articles related to the event. He wrote an insightful article for *Chess Life* magazine. It reached all members the United States Chess Federation, several tens of thousands of chess players.



1st U.S. Computer Championship

by Hans Berliner

In New York City from August 31 to September 2, 1970, six chess programs running on computers as far away as Texas and Alberta, Canada, competed for the title of U.S. Computer Champion. The tourney was a three-round Swiss-system event, the time limit being 40 moves in two hours, with up to three 20-minute breaks allowed each computer in each game for equipment difficulties.

Three of the computers were directly connected by telephone lines to input/output terminals in the New York Hilton Hotel. Here the operators of the programs typed in the moves made by the opponent computer, and in due time the computer would type back its reply. Two other computers were connected by voice telephone so that the operator at the computer site merely had to say the move made by the computer into the telephone for it to be actually played in New York. The sixth competitor was a mini-computer, so called because of its size and cost. This computer was located at the tournament site and had a television-type display on which the current position was shown. When the computer made a move the display changed. When its opponent made a move, this was communicated to the computer by means of a "light pen" with which the operator touched the piece that is moving and then the square to which it is going.

The tournament resulted in a well-deserved win for a Control-Data Corporation 6400 computer, a large Scientic machine programmed by and located at Northwestern University in Evanston, Ill. This program beat all of its opponents to score 3-0.

Second place was taken by the mini-computer, a Varian 6201 belonging to Information Displays, Inc. This program scored 2-1 but benefited greatly in the pairings by getting to play the two weakest programs and only one of the better ones.

Tied for third and fourth with 1½-1½ were a program developed by Dennis Cooper of Bell Telephone Labs in New Jersey and a program developed at Carnegie-Mellon University by Hans Berliner, the world correspondence champion. The latter program ran on an IBM 360/91 at Columbia University. Fifth was a program developed by a team at Texas A&M University which scored 1-2, and last with 0-3 was a program developed by Tony Marsland and running from the University of Alberta in Canada.

There were audiences of up to 400 persons, including Grandmaster Pal Benko. Major feature space was given the event in The New York Times. Frequently the audience was derisive of a move made by one of the computers, little realizing that the obvious move preferred by the audience was inferior.

It is fair to say that no new chess theory will develop from this tournament, nor were any extremely brilliant or profound moves made. However, the tourney also shows that since 1967, when the first real breakthroughs in computer chess were made, quite a bit has been accomplished. The winning program played a very steady game at about the Class B level. It appeared to be totally free of gross blunders and would probably hold its own in an average chess tourney. It was too bad, in a way, that the first American program to play worthwhile chess did not compete. This program was developed by Richard Greenblatt of M. I. T. and has been improved over the years. It is rumored to be able to play Class A chess at present. It would have been interesting to see it compete with the Northwestern program.

The problems of programming a computer to play chess are rather imposing. Clearly the computer cannot look at all possible game continuations up to checkmate (or a draw) as there are 10^{120} possible games from the initial position. If every atom in the universe was a computer and each had been calculating chess variations at the rate of one per second for 14 billion years (since the beginning of the universe), they would have completed only a small fraction of the total number of variations to be calculated. Similarly, there are about 10^{50} legal chess positions. If we could store the best move for each one of these positions, then we could have a computer that played perfect chess. But there are no storage devices to hold so much information nor people to catalog so many positions, not to speak of the search time required by a computer to find the right position in its catalog.

Chess playing computers, therefore, must work very much as you and I, analyzing plausible-looking alternatives and eventually making judgments about the qualities of a given position. The variations analyzed are then arranged as a "tree of possibilities" and the values assigned to positions at the end of "branches" are compared to find the computer "idea" of best play for both sides. The computer then makes the first move of this best play sequence.

Presented below is a game from the computer championship. When Black made its 47th move, the audience burst into applause.

	Berliner Program		Northwestern Program	
1	P-Q4	N-KB3	27 R-Q2	K-N2
2	P-QB4	P-K3	28 B-QB4	R/2-B1
3	N-QB3	B-N5	29 R-Q7ch	R-K2
4	P-K3	BxNch	30 RxRch?	NxR
5	PxB	N-B3	31 B-Q4ch	K-R3
6	P-Q5	N-K2	32 B-K5	R-B1
7	PxP	BPxP	33 P-R4	P-B3
8	R-N1	N-B3	34 B-K6	R-K1
9	B-Q3	Q-K2	35 B-KB7	R-Q1
10	N-B3	P-K4	36 B-QB4	R-Q8ch
11	B-B5	P-K5	37 K-R2	N-Q4
12	N-Q4	Q-B4!	38 P-KN4	P-KN4
13	R-N5	QxP	39 PxPch?	KxP
14	Q-N3	QxQ	40 K-R3	N-B5ch
15	PxQ	NxN	41 BxNch	KxB
16	KPxN	O-O	42 B-K2	R-Q7
17	O-O	P-QR3	43 B-B1	RxP
18	R-B5?	P-Q3	44 B-B4	R-B6ch
19	BxB	PxR	45 K-R4	RxP
20	B-K6ch	K-R1	46 B-N8	P-K6
21	PxP	QR-K1	47 B-B4	RxB
22	B-QB4	N-N5	48 PxR	P-K7
23	B-K2	N-K4	49 P-N5	
24	B-K3	P-KN3		P-K8=Qch
25	R-Q1	R-B2	50 K-R5	
26	R-Q4	N-B3		Q-R8 mate

"1st U.S. Computer Championship" by Hans Berliner. [Berliner, 1970]

The most interesting and perhaps least known report on the 1970 tournament came from a relatively unknown author. The article, "The Program Was a Fish," appeared in 1972. The author was a recent Northwestern University graduate who had a strong interest in computers and chess. He knew Atkin and Slate, which likely motivated his writing effort. Here is the start of the article:

Once upon a time there was a fish.

A most unusual fish, worth several million dollars. It lived in a one-story building with a grass-covered roof on the campus of Northwestern University. It had transistors instead of scales, tape reels instead of fins, and an electronic memory instead of gills. It preferred eating punch cards to eating fish food.

Most people would have called the fish a computer. To be precise, they would have called it a Control Data Corporation (CDC) 6400.

It was a CDC 6400, of course. But it was also a fish.

A fish, you see, is a chess player. A bad chess player. The title is awarded by other players when one of their peers exhibits a singular skill in losing chess games. Popular synonyms are "patzer" and "meatcake."

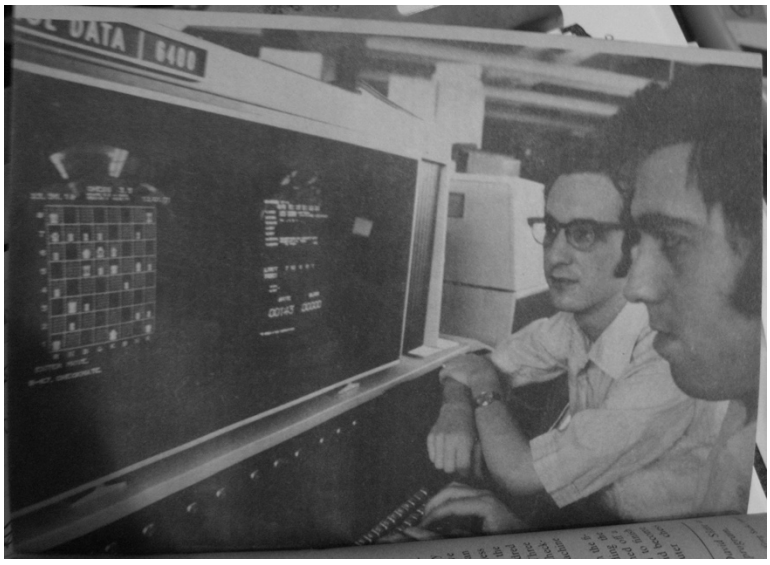
And Northwestern's CDC 6400 was a chess player. A bad one. A fish. During the years of tournament play, the machine earned the title not once, but several times. A whole legion of human opponents regularly blasted the machine off the board.

Then, one day during the summer of 1970, the fish became a champion.

It happened in New York City, during the twenty-fifth annual convention of the Association for Computing Machinery (ACM). Meeting at the New York Hilton Hotel, the ACM decided to enliven its proceedings with the world's first all-computer chess tournament.

Six competitors swam to the surface for the three-round event, including programs from sites as distant as Texas and Alberta, Canada. Among the six was CHESS 3.0 – Northwestern's electronic fish.

The author's name was George R.R. Martin [1972]. Perhaps you know one of his more recent works? *Game of Thrones*.



From George R.R. Martin's "The Computer Was a Fish." [Martin, 1972]
Larry Atkin (left) and David Slate.

Conclusion

Thus began the 50-year project to build a chess program capable of competing with (and, eventually exceeding the abilities of) strong human players. And the experiment continues to this day and for the foreseeable future.

Starting in 1970, progress in computer chess program development accelerated. Monty Newborn succinctly summarizes the scientific aspects of the next quarter-century of progress, culminating in the 1997 DEEP BLUE match [Newborn, 2005]:[5]

> *There was a lot of sharing of ideas. There were several key ideas, of course. As the great experiment went along, the [idea of] minimax was shared by thousands. That's the first perhaps big idea. The alpha beta algorithm became quickly spread around the community. The idea of using large hash tables, or transposition tables, got spread around in the late '60s and early '70s. The Greenblatt program was one of the early ones. The key ideas - minimax, alpha beta, the use of large hash tables – and that was then followed by [Northwestern University Professor] Peter Frey's idea of using iterative deepening search rather than straight depth-first search. The introduction of iterative deepening depth-first search moved the programs up from playing about a weak class A to almost master level in about a one or two year period. Following iterative deepening, Ken Thompson's BELLE came in with the special purpose hardware. As soon as Thompson came in ... others followed right along. Following the special purpose hardware, one looked into a search using many computers in parallel. All of these ideas were shared by others as one marched along. Furthermore, at our ACM conferences every year, we held panel discussions in which the ideas were pretty well shared... . There was a certain amount of material published in the major publications. In general, the community was a very close community. We had lots of fun together. Following the games, we generally went out to dinner and had a good time and talked. Early on, of course, there were the Russians involved. It was always exciting, getting together with the Russians and talking chess and politics. It was quite an exciting period.*

The 1970 United States Computer Chess Championship was an historic milestone for chess, computer chess, artificial intelligence, and computer science. It was the first computers-only competition. Of course, since then there has been an explosion of computer competitions, from racing autonomous vehicles (DARPA Grand Challenge) to improving conversational abilities (Loebner Prize[6]) to identifying user preferences (Netflix Prize), and so on. Indeed, there is nothing like an interesting competition (with appropriate rewards) to spur on research and development efforts.

The tournament was a success and became an annual event through to 1994. It was soon renamed as the North American Computer Chess Championship. Many of the people who competed in the ACM events went on to impressive careers, including in industry, academia, and government. One even won the Turing Award (Ken Thompson).

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[5] The text was given verbally. Minor edits have been made to the wording.

[6] Of interest is that the 1997 and 2009 events were won by former ICGA President David Levy. Computer Go pioneer Bruce Wilcox won in 2010, 2011, 2014, and 2015. The competitive spirit of games transfers easily to other domains.

Today, to many in computer science, computer chess history stops in 1997 with the DEEP BLUE victory over Garry Kasparov. That is to be regretted, as it diminishes the credit that is due to the computer chess community for their impact on the field of artificial intelligence. Only recently has computer chess had an uptick in media and technical interest, the result of the ALPHAZERO project [Silver *et al*., 2018]. The computer chess community – past and present – should be proud of our accomplishments.

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Sarah Beth's excellent blog posting "The First Computer Chess Championship in the USA" was a useful resource for this article [Beth, 2017].

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