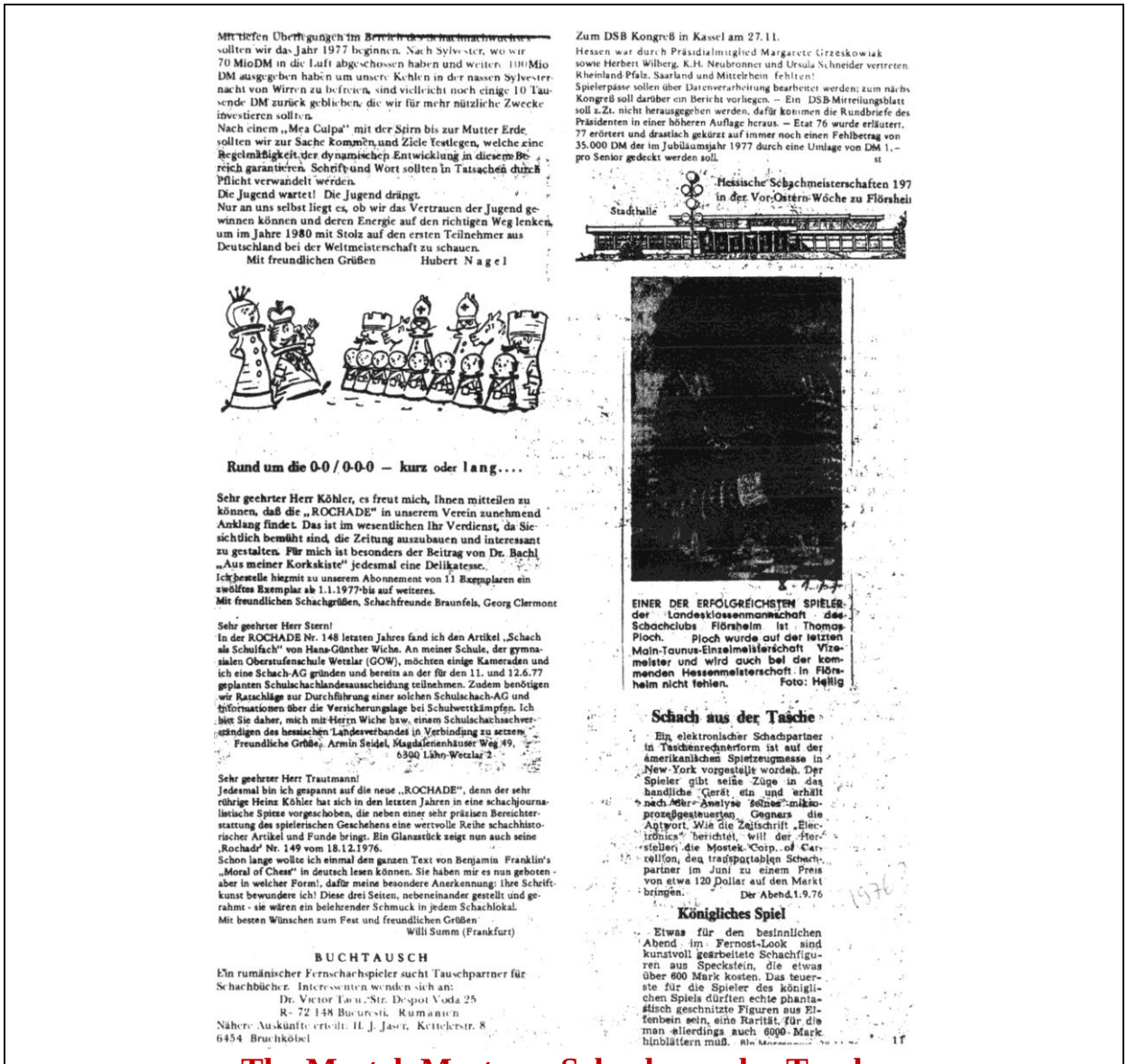
02-1976 [P-5201] Mostek Corporation - **Chess mate** (operational prototype)
In 2014, I began researching this chess computer in my archives under the title "The Mostek Mystery". In reality, there wasn't much to study, as there was simply too little usable information available. I hit a dead end and let the matter rest. Yet, I couldn't quite let it go over the years, and on April 13, 2019, I posted a call for information on the HIARCS Chess Forums. A few forum members offered trivial, inconsequential comments. Only Mike Watters responded seriously, though even he couldn't really help me move forward. Without enough puzzle pieces, it is impossible to see the full picture, so I had to drop the subject once more. Then, by chance, in September 2025, I read an article by David Galef titled "A Chess Piece." This article identified David Lindsay as the programmer of the Mostek "Chess mate" chess computer! Suddenly, I had enough clues to piece the whole puzzle together. So, in this article, I am going to lay out the entire historical story. I want to start right at the beginning, with those initial puzzle pieces. It is actually quite remarkable that, over the years, no one has investigated or recognized the historical value of the "Chess mate" prototype!

In-depth regards from Hein Veldhuis



Mit tiefen Überlegungen im Bereich des Machbaren sollten wir das Jahr 1977 beginnen. Nach Sylvester, wo wir 70 Mio DM in die Luft abgeschossen haben und weitere 100 Mio DM ausgegeben haben um unsere Kehlen in der nassen Sylvesternacht von Wirren zu befreien, sind vielleicht noch einige 10 Tausende DM zurück geblieben, die wir für mehr nützliche Zwecke investieren sollten.
Nach einem „Mea Culpa" mit der Stirn bis zur Mutter Erde sollten wir zur Sache kommen und Ziele festlegen, welche eine Regelmäßigkeit der dynamischen Entwicklung in diesem Bereich garantieren. Schrift und Wort sollten in Tatsachen durch Pflicht verwandelt werden.
Die Jugend wartet! Die Jugend drängt.
Nur an uns selbst liegt es, ob wir das Vertrauen der Jugend gewinnen können und deren Energie auf den richtigen Weg lenken, um im Jahre 1980 mit Stolz auf den ersten Teilnehmer aus Deutschland bei der Weltmeisterschaft zu schauen.
Mit freundlichen Grüßen Hubert Nagel

Rund um die 0-0 / 0-0-0 – kurz oder lang....

Sehr geehrter Herr Köhler, es freut mich, Ihnen mitteilen zu können, daß die „ROCHADE" in unserem Verein zunehmend Anklang findet. Das ist im wesentlichen Ihr Verdienst, da Sie sichtlich bemüht sind, die Zeitung auszubauen und interessant zu gestalten. Für mich ist besonders der Beitrag von Dr. Bachl „Aus meiner Korkskiste" jedesmal eine Delikatesse.
Ich bestelle hiermit zu unserem Abonnement von 11 Exemplaren ein zwölftes Exemplar ab 1.1.1977 bis auf weiteres.
Mit freundlichen Schachgrüßen, Schachfreunde Braunfels, Georg Clermont

Sehr geehrter Herr Stern!
In der ROCHADE Nr. 148 letzten Jahres fand ich den Artikel „Schach als Schulfach" von Hans-Günther Wiche. An meiner Schule, der gymnasialen Oberstufenschule Wetzlar (GOW), möchten einige Kameraden und ich eine Schach-AG gründen und bereits an der für den 11. und 12.6.77 geplanten Schulschachlandesausscheidung teilnehmen. Zudem benötigen wir Ratschläge zur Durchführung einer solchen Schulschach-AG und Informationen über die Versicherungslage bei Schulwettkämpfen. Ich bitt Sie daher, mich mit Herrn Wiche bzw. einem Schulschachsachverständigen des hessischen Landesverbandes in Verbindung zu setzen.
Freundliche Grüße, Armin Seidel, Magdalenenhäuser Weg 49, 6300 Lahn-Wetzlar 2

Sehr geehrter Herr Trautmann!
Jedesmal bin ich gespannt auf die neue „ROCHADE", denn der sehr rührige Heinz Köhler hat sich in den letzten Jahren in eine schachjournalistische Spitze vorgeschoben, die neben einer sehr präzisen Berichterstattung des spielerischen Geschehens eine wertvolle Reihe schachhistorischer Artikel und Funde bringt. Ein Glanzstück zeigt nun auch seine ‚Rochade' Nr. 149 vom 18.12.1976.
Schon lange wollte ich einmal den ganzen Text von Benjamin Franklin's „Moral of Chess" in deutsch lesen können. Sie haben mir es nun geboten - aber in welcher Form!, dafür meine besondere Anerkennung: ihre Schriftkunst bewundere ich! Diese drei Seiten, nebeneinander gestellt und gerahmt - sie wären ein belehrender Schmuck in jedem Schachlokal.
Mit besten Wünschen zum Fest und freundlichen Grüßen
Willi Summ (Frankfurt)

BUCHTAUSCH
Ein rumänischer Fernschachspieler sucht Tauschpartner für Schachbücher. Interessenten wenden sich an:
Dr. Victor Tacu, Str. Despot Voda 25
R- 72 148 Bucuresti, Rumanien
Nähere Auskünfte erteilt: H. J. Jaser, Kettelerstr. 8
6454 Bruchköbel

Zum DSB Kongreß in Kassel am 27.11.
Hessen war durch Präsidialmitglied Margarete Grzeskowiak sowie Herbert Wilberg, K.H. Neubronner und Ursula Schneider vertreten. Rheinland-Pfalz, Saarland und Mittelrhein fehlten!
Spielerpässe sollen über Datenverarbeitung bearbeitet werden; zum nächs Kongreß soll darüber ein Bericht vorliegen. – Ein DSB-Mitteilungsblatt soll z.Zt. nicht herausgegeben werden, dafür kommen die Rundbriefe des Präsidenten in einer höheren Auflage heraus. – Etat 76 wurde erläutert, 77 erörtert und drastisch gekürzt auf immer noch einen Fehlbetrag von 35.000 DM der im Jubiläumsjahr 1977 durch eine Umlage von DM 1,– pro Senior gedeckt werden soll. st

Hessische Schachmeisterschaften 197 in der Vor-Ostern-Woche zu Flörshei

Stadthalle

EINER DER ERFOLGREICHSTEN SPIELER der Landesklassenmannschaft des Schachclubs Flörsheim ist Thomas Ploch. Ploch wurde auf der letzten Main-Taunus-Einzelmeisterschaft Vizemeister und wird auch bei der kommenden Hessenmeisterschaft in Flörsheim nicht fehlen. Foto: Hellig

Schach aus der Tasche

Ein elektronischer Schachpartner in Taschenrechnerform ist auf der amerikanischen Spielzeugmesse in New York vorgestellt worden. Der Spieler gibt seine Züge in das handliche Gerät ein und erhält nach Analyse seines mikroprozeßgesteuerten Gegners die Antwort. Wie die Zeitschrift „Electronics" berichtet, will der Hersteller, die Mostek Corp. of Carrollton, den transportablen Schachpartner im Juni zu einem Preis von etwa 120 Dollar auf den Markt bringen.
Der Abend, 1.9.76

Königliches Spiel

Etwas für den besinnlichen Abend im Fernost-Look sind kunstvoll gearbeitete Schachfiguren aus Speckstein, die etwas über 600 Mark kosten. Das teuerste für die Spieler des königlichen Spiels dürften echte phantastisch geschnitzte Figuren aus Elfenbein sein, eine Rarität, für die man allerdings auch 6000 Mark hinblättern muß.

The Mostek Mystery: Schach aus der Tasche
Quelle: https://rochadeeuropa.com/ – 15 Januar 1977

The Mostek Mystery: Schach aus der Tasche

In 1976, the very first micro chess computer was presented at the toys-fair at New York. This model was built by a american firm named "Mostek". But this computer never came on the market!

One of the most mysterious reports in the history of computer chess I have ever read! I have done research on Mostek Corporation from Texas in the past, but I still did not get a satisfactory answer in my research on Mostek why their chess computer never got beyond a supposed prototype! I gave up the courage at the time because of other items…

Schach aus der Tasche

Ein elektronischer Schachpartner in Taschenrechnerform ist auf der amerikanischen Spielzeugmesse in New-York vorgestellt worden. Der Spieler gibt seine Züge in das handliche Gerät ein und erhält nach der Analyse seines mikroprozeßgesteuerten Gegners die Antwort. Wie die Zeitschrift „Electronics" berichtet, will der Hersteller, die Mostek Corp. of Carrollton, den transportablen Schachpartner im Juni zu einem Preis von etwa 120 Dollar auf den Markt bringen.

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In der Zeitschrift Rochade vom 15. Januar 1977 erschien eine kurze Meldung mit dem Titel "Schach aus der Tasche". In dieser Meldung, die aus dem *Abend* vom 1 September 1976 stammte, wurde eine kleine Sensation vorgestellt: der erste Taschenschachcomputer der Welt! Bis dahin war Computerschach den Großen Universitäten und ihren riesigen Rechnern vorbehalten gewesen. Auf der amerikanischen Spielwarenmesse 1976 in New York wurde von der Firma Mostek ein elektronisches Schachspiel vorgestellt, das ab Juni zum Preis von 120 Dollar verkauft werden sollte.

Hein Veldhuis (2019)
The Mostek Mystery!

As we can learn from the old literature, in March 1977, Fidelity Electronics was the company that commercially launched the world's first micro-chess computer, the Chess Challenger (1) in the USA. The development of this chess computer started in 1976. Fidelity had developed no fewer than 7 prototypes, of which only 3 were operational.

It was clear that in 1976 more firms were busy in the battle to bring the first commercial microchess computer on the market. One was Data Cash Systems which presented the CompuChess (1) in November 1977. This very compact chess computer was put on the market by the company Staid Incorporated from Florida. In February 1978 Applied Concepts & Chafitz followed with their famous Boris in the wooden box.

But there was another company that was busy in 1976 developing a microchess computer. That was the company Mostek Corporation from Texas. At the 1976 American toy fair in New York, the Mostek company presented an electronic chess set that would be sold for $ 120 that same year. The announcement of the Mostek company alone shows that they were confident and had a progressive view of their ambitions to be the first company in the world to commercialize a microchess computer in 1976.

Afterwards we can of course easily say that something must have gone horribly wrong at Mostek, because after that announcement at the American toy fair nothing was heard anymore. Nowhere on the internet did I get real answers. I always came across the brief announcement from the Rochade, but it was elusive. For me as a historian a frustrating undertaking! I baptized my file ... The Mostek Mystery!

Over the years I had prepared the following questions:

- **Because what was presented by the Mostek company at the toy fair in New York in 1976 and who was present at that?**
- **Was it an (operational) prototype or just a dummy?**
- **Have demonstrations been played with?**
- **Why was no commercial model produced from this prototype?**
- **Who was involved with Mostek in the development of this microchess computer?**
- **Who was the programmer? Was it Peter R. Jennings (KIM-1 or a precursor)?**
- **Where did this prototype go? Did photos or articles appear in magazines or newspapers after this toy fair?**

Source: The Mostek Mystery by Hein Veldhuis (2019)

Hein Veldhuis (2019)
The Mostek Mystery!

Next… my investigation and searching through the internet:

- MOS Technology and MOSTEK are two different and unrelated companies. Much of the literature on the Web confuses these two companies!?
- MOS Technology, Inc. "MOS" being short for Metal Oxide Semiconductor.
  CMOS = Complementary Metal Oxide Semiconductor.
- In 1976 the very first chess computer was presented at the toys-fair at New York! This model was built by a american firm named Mostek.
- Z80 microprocessor from Zilog was available in February 1976.
  The first computer that used this CPU was the Z-1 from Cramenco.
- The 6501 and 6502 micro processor was developed by MOS Technology Corporation. Its relative low price (25US$) was the reason why Steve Wozniak selected this processor for his first computer the Apple I (the predecessor of the Apple II). The 6502 processor was soon to be used in Commodore computers. At this point the Intel 8080 cost about US $150.
- KIM-1 = Keyboard Input Monitor.
- MOS KIM-1 History:
  In August 1974 eight Motorola employees including Bill Mensch and Chuck Peddle quit and went to work for a small chip manufacturer called MOS Technologies. By June of 1975 they had developed samples of the 6502 processor and wanted a system to demonstrate it's power. The chip was only US $25 at a time when the lesser Motorola 6800 was selling for $200. In 1976 MOS build the worlds first single board computer the KIM-1. Of course it used the 6502 (clocked at 1 Mhz) and it came with 1K RAM, built in ROM, Hex Keypad, LED Display, 15 bidirectional input/output ports and a Cassette Interface. These machines came fully assembled although they lacked a power supply.

1976…

- Commodore sets up shop on Palo Alto California
- MOS Technologies release the KIM-1 Microprocessor Trainer, a single board computer. Rtail $245.
- [October] In order to stop being the "middle man" Commodore purchases MOS Technologies for $800,000 as well as Frontier, a Los Angeles manufacturer of CMOS chips, and MDSA, a LCD maker. Chuck peddle convinces Jack Tramiel that the next market is with computers and jack says to build one.

Source: The Mostek Mystery by Hein Veldhuis (2019)

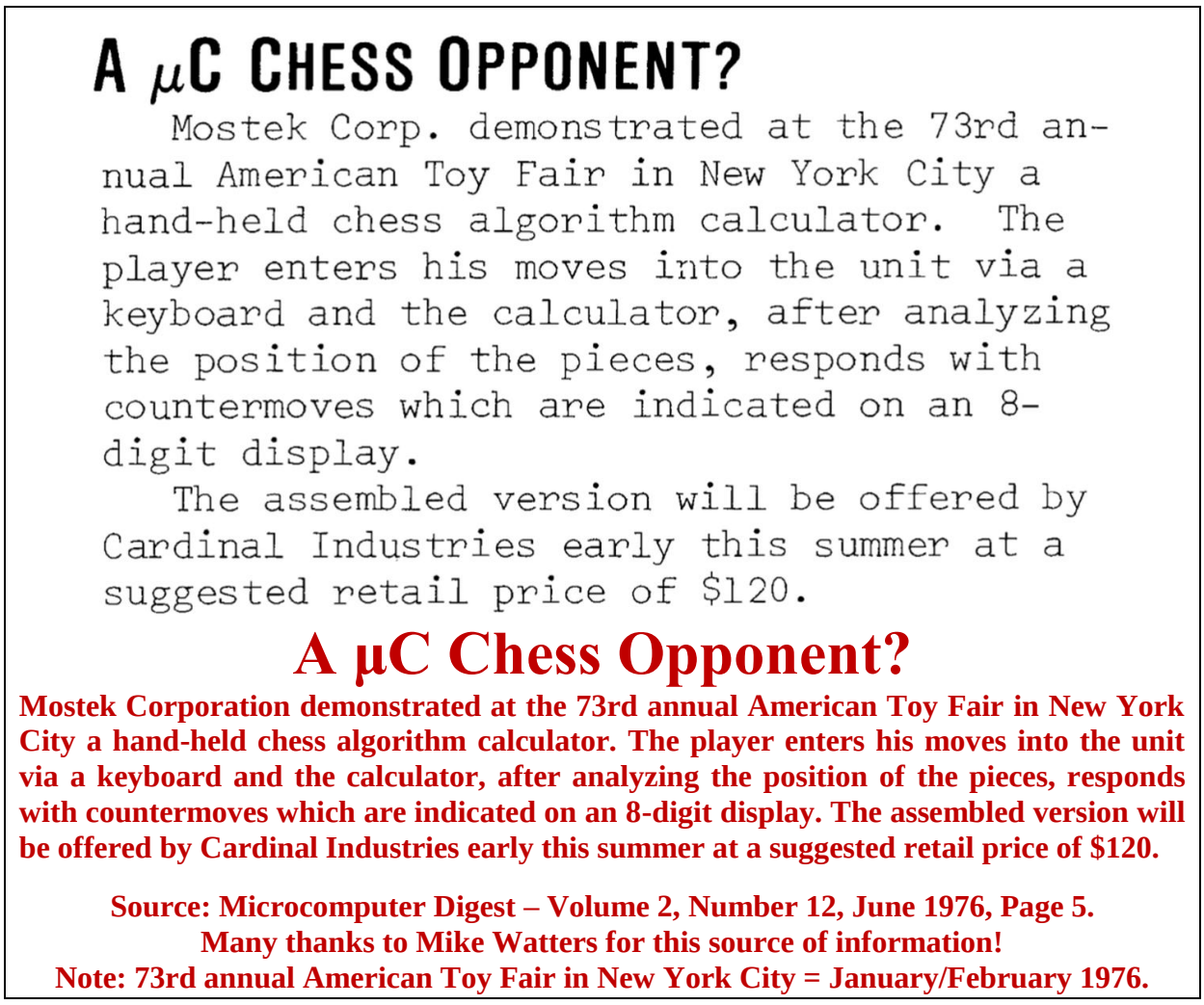
Hein Veldhuis (2025)
The Mostek Mystery!

https://www.schaakcomputers.nl/hein_veldhuis/database/files/05-1977,%20A%20Chess%20Piece%20(smaller,%20compact%20systems%20are%20playing%20better%20and%20better%20chess).pdf

This article contains a very important hidden piece of information!
Anyone unfamiliar with computer chess history might easily overlook it without understanding its importance…

This is the following text from the article…

… Not too long ago, there appeared an article in the New York *Post* advertising a mini-microcomputer to be marketed soon, at about $120, whose sole purpose is to play chess. The manufacturer, Cardinal Industries, Incorporated, claims the machine can operate on eight different levels of play, from a few seconds a move to a few hours, as the standard of play goes up. The programmer, David Lindsay, acknowledged that it was no Fischer but did say, "I must confess it beat me once at level three."



A μC CHESS OPPONENT?

Mostek Corp. demonstrated at the 73rd annual American Toy Fair in New York City a hand-held chess algorithm calculator. The player enters his moves into the unit via a keyboard and the calculator, after analyzing the position of the pieces, responds with countermoves which are indicated on an 8-digit display.

The assembled version will be offered by Cardinal Industries early this summer at a suggested retail price of $120.

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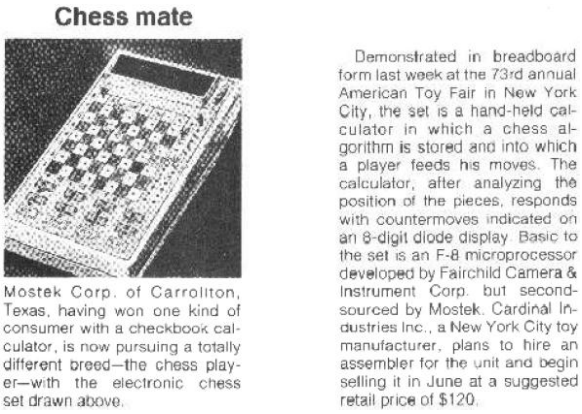
Source: Microcomputer Digest – Volume 2, Number 12, June 1976, Page 5.
Many thanks to Mike Watters for this source of information!
Note: 73rd annual American Toy Fair in New York City = January/February 1976.

Source: The Mostek Mystery by Hein Veldhuis (2025)

Hein Veldhuis (2025)
The Mostek Mystery!



Chess mate

Mostek Corp. of Carrollton, Texas, having won one kind of consumer with a checkbook calculator, is now pursuing a totally different breed—the chess player—with the electronic chess set drawn above.

Demonstrated in breadboard form last week at the 73rd annual American Toy Fair in New York City, the set is a hand-held calculator in which a chess algorithm is stored and into which a player feeds his moves. The calculator, after analyzing the position of the pieces, responds with countermoves indicated on an 8-digit diode display. Basic to the set is an F-8 microprocessor developed by Fairchild Camera & Instrument Corp. but second-sourced by Mostek. Cardinal Industries Inc., a New York City toy manufacturer, plans to hire an assembler for the unit and begin selling it in June at a suggested retail price of $120.

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Source: From a German chess club in Berlin - May 1976
Many thanks to Rob van Son for this source of information!

In closing, the following regarding the new information that has only just come to me (September 2025). The "Chess mate prototype" from manufacturer Cardinal Industries and Mostek Corporation was thus operational and programmed by David Lindsay! What else can I conclude from this? David Lindsay is the programmer for Applied Concepts/Chafitz BORIS, which entered the American market in February 1978. BORIS also had an F-8 microprocessor developed by Fairchild, so it wasn't that difficult for him to implement his chess program at another manufacturer. Only David Lindsay knows what went wrong at Cardinal Industries and Mostek Corporation!

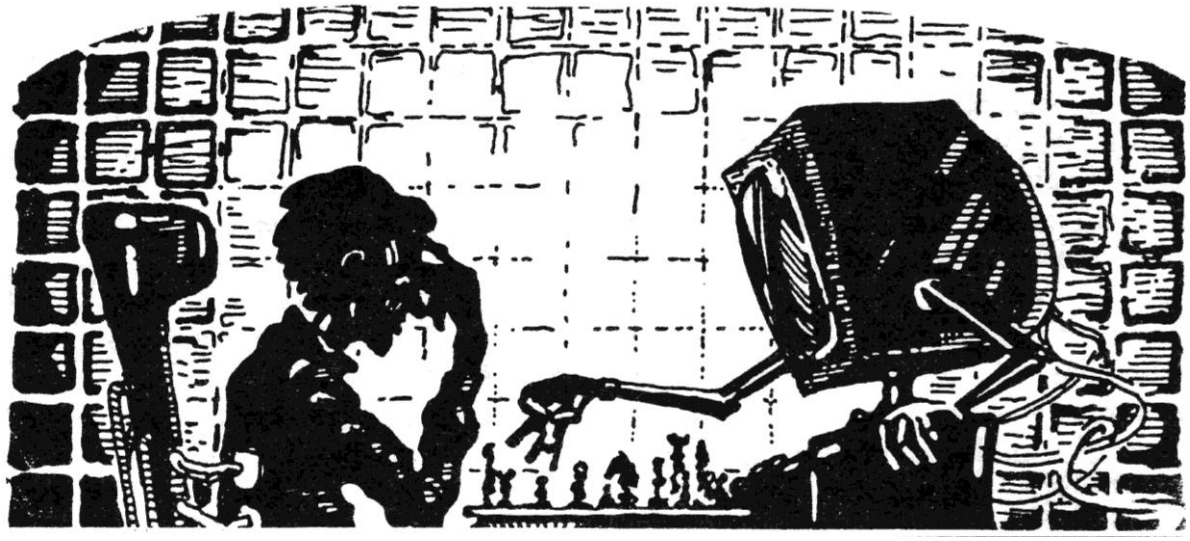
Where can I contact David Lindsay personally? Three years ago, the following person commented on a YouTube video. For the video, see: https://www.youtube.com/watch?v=vSAFya-tJC8

@joemonktx 3 jaar geleden

So... I know David Lindsay personally. David is the programmer of this game. It has a fairchild F8 processor, and only 1K of ram! The computer that Boris was developed on was hand-assembled and all of the cards in it were wire-wrapped to the back main bus. The game was actually loaded into the development computer using paper tape. David had a teletype model 33 which was interfaced to the development computer, and used to print listings and punch paper tapes of the program. David lived in Flower Mound, Texas during the middle to late 1970s. He now lives on the east coast.

Source: The Mostek Mystery by Hein Veldhuis (2025)

And now, I am going to reveal the secret...



The prototype of the "Chess mate" chess computer by Mostek Corporation was unveiled at the 73rd American Toy Fair in New York City in February 1976 more than a year before the first true commercial release of a micro-chess computer, the Chess Challenger (1) from Fidelity Electronics!

At the fair, Mostek Corporation and their partner, Cardinal Industries, displayed the device in what was known as "breadboard" form (a functional prototype mounted on a test circuit board). Press reports from the time (such as in the trade journal *Electronics*) described the device as a handheld unit resembling a high-end pocket calculator. Players entered their moves via a keypad, and the machine communicated its counter-moves on an 8-digit LED display.

That moment in February 1976 marked the very first time the public and the toy industry were introduced to the technology that would eventually (through Applied Concepts) become the iconic BORIS chess computer (launched in February 1978)!

The calculator vibe
The chess computer was designed to look like a chunky, high-end pocket calculator (the prevailing design trend at the time).

The interface
At the bottom, you see the compact keypad the player used to enter coordinates (such as E2–E4), while the display at the top showed the counter-moves generated by David Lindsay's algorithm.

Portability
The idea was simply to place the device next to your physical chessboard, giving you your 'invisible' opponent right at hand.

And now, I am going to reveal the secret...

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Mostek Corporation & Cardinal Industries Inc.: Chess mate

Source: American trade journal *Electronics* – March 1976

https://www.worldradiohistory.com/Archive-Electronics/70s/76/Electronics-1976-03-04.pdf

And now, I am going to reveal the secret...

The introduction of the Mostek "Chess mate" at the American Toy Fair
Its unveiling at the American Toy Fair in New York in February 1976 was a spectacular event. You have to picture the state of the computer world in 1976: it was still in its infancy the very first Apple I wasn't due to launch until that summer, and to the general public, computers were still seen as gigantic, prohibitively expensive machines housed in university laboratories. So, when Mostek Corporation and Cardinal Industries suddenly showcased a working prototype of a chess computer that fit in the palm of your hand, it caused a sensation.
Reactions from the press, the toy industry, and the public perfectly illustrate just how revolutionary this was at the time.

Reaction from the trade press: Disbelief at the technology
Respected technology magazines (including the leading American trade journal *Electronics*) pounced on the demonstration. Journalists were deeply impressed that Mostek had managed to cram a complex chess algorithm (written by David Lindsay) entirely into the brand-new Fairchild F8 microprocessor. The press wrote admiringly about how this "handheld calculator" could independently analyze piece positions and spit out its countermoves via a simple 8-digit LED display. The fact that a chip measuring barely a few millimeters could calculate something as complex as chess was hailed as a technological feat.

The toy industry: "This changes everything"
For the traditional toy buyers at the fair, the device came as a total culture shock. Cardinal Industries was an established name in classic board games (such as dominoes and mahjong) at the time, and the fact that *they* were the ones to come up with something like this caused quite a stir. The toy industry immediately realized that this marked the beginning of a whole new era: electronic toys. Buyers envisioned a massive market of people who wanted to play chess but couldn't find a human opponent at home.

The public: Magic and skepticism
To the average trade show visitor, the demonstration bordered on magic. People queued up to watch the makeshift breadboard prototype (an exposed circuit board teeming with wires and chips) actually play a game of chess.
At the same time, there was skepticism. Reports from the time announced that Cardinal Industries planned to launch the chess computer in June of that year with a recommended retail price of $120. That was a huge sum for a "toy" back then (equivalent to over $600 today!). Many wondered whether the average consumer would really be willing to spend that much money on an electronic chess partner.

The aftermath of the trade show
Although the presentation in February 1976 got things off to a flying start, the promised release date of June 1976 proved far too optimistic. Refining the hardware, debugging Lindsay's software, and setting up full-scale mass production took much longer than anticipated. While the prototype shown at the Toy Fair had ignited the spark, it ultimately took until February 1978 for consumers to actually buy the technology in stores not as the Cardinal Chess mate, but housed in the beautiful wooden casing of the **BORIS computer!!**

On Mostek Corporation and MOS Technology, two companies that (more or less by coincidence) developed a chess computer named "Chess mate" or "Chessmate."

Although the names are very similar and both companies were founded in the same year (1969), they emerged completely independently of one another:

The name "MOS": Both Mostek and MOS Technology derived their names from the then-revolutionary chip technology known as MOS (Metal-Oxide-Semiconductor).

Mostek was founded in Texas by former employees of the chip giant Texas Instruments. The name is a portmanteau of "MOS" and "Tek" (short for "technology").

MOS Technology was founded in Pennsylvania by former employees of General Instrument. To avoid confusion, the name was pronounced letter-by-letter at the time ("M-O-S Technology"), whereas Mostek was simply pronounced "Moss-tek."

The connection to the "Chess mate" chess computer

Confusion between the two is quite understandable, especially regarding the Chess mate chess computer. Here is how the situation unfolded:

MOS Technology designed the famous MOS 6502 processor.

1. The Commodore Chessmate chess computer with a program by Peter Jennings and was designed in 1978 to run on that very 6502 processor.
2. Because MOS Technology was acquired by the computer manufacturer Commodore around that time, Commodore ultimately brought the Chessmate to market.
3. Their competitor, Mostek, had developed a completely different chess computer by David Lindsay with the same name ("Chess mate") in 1976 under a licensing agreement.

In short: they were two fierce competitors who happened to use the same abbreviation and, within a very short span of time, gave the same name to their respective chess computers.

A brief history of Mostek Corporation

Mostek Corporation was founded in March 1969. The company started in Worcester, Massachusetts, but soon relocated its primary operations to Carrollton, Texas. Its founders were L.J. Sevin, Louay E. Sharif, Richard L. Petritz, and Robert B. Palmer a group of engineers who had recently left their previous employer, the chip giant Texas Instruments. During the 1970s, the company grew at record speed to become one of the world's leading chip manufacturers, driven largely by its revolutionary memory chips (DRAM).

Mostek's history is a fascinating tale of soaring highs and a sudden, dramatic downfall. In the 1970s, the company was a true pioneer that changed the computing world forever, but in the 1980s, a disastrous price war proved fatal.

Here is the story of their technological breakthroughs and ultimate demise:
The Revolutionary Chips: The "Calculator-on-a-Chip"
Shortly after its founding in 1969, the young start-up Mostek received a challenging assignment from the Japanese company Busicom. Busicom wanted to manufacture compact calculators and was looking for advanced chips.
While competitor Intel was working on a chipset for Busicom that would eventually lead to the very first microprocessor (the Intel 4004), Mostek pursued a different technological breakthrough:

- In November 1970, Mostek introduced the MK6010.
- This was the world's first single-chip calculator circuit.
- Mostek succeeded in condensing the entire electronics system of an electronic calculator (which previously consisted of dozens of separate components) onto a single chip.
- Thanks to this chip, Busicom was able to launch the legendary Busicom Handy LE-120A: the world's first true pocket calculator.

The King of Computer Memory (DRAM)
Mostek's greatest success was yet to come. In 1973, they invented the MK4096, a 4-kilobit DRAM (Dynamic Random-Access Memory) chip.
What made this chip revolutionary was a technique called address multiplexing. This allowed the chip to use far fewer pins (connections) and take up less space on a printed circuit board. It immediately became the global industry standard. By the late 1970s, Mostek had become a giant, commanding a market share of no less than 85% of the global DRAM market.

The Downfall in the 1980s
At the absolute peak of its success in 1979, Mostek was acquired for a massive sum ($345 million) by the industrial conglomerate United Technologies Corporation (UTC). However, that success proved fragile. In the early 1980s, the market collapsed for Mostek due to a combination of factors:

- The Japanese invasion: Major Japanese electronics companies (such as Toshiba, NEC, and Hitachi) entered the memory market. Backed by their government, they began flooding the US market with high-quality, extremely cheap DRAM chips (a practice the US labeled as "dumping" at the time).
- Lack of diversification: While competitor Intel decided in time to stop producing memory chips and focus entirely on microprocessors (such as the later x86 processors), Mostek stubbornly clung to DRAM memory.
- Huge losses: As memory chip prices plummeted due to cutthroat competition, Mostek lost millions of dollars. In the first nine months of 1985 alone, the company suffered a loss of $328 million. The End and the Legacy

In October 1985, parent company UTC finally pulled the plug, and Mostek closed its doors. Thousands of employees lost their jobs. The remnants and valuable patents were sold for a pittance to the French company Thomson-CSF.
Although the Mostek name disappeared, its DNA lives on. Thomson later merged with an Italian partner to form STMicroelectronics still one of the world's largest chip manufacturers today!
It is fascinating how rapidly the chip market changed back then.

The collaboration between Mostek Corporation and Cardinal Industries

In 1976, chip manufacturer Mostek and games manufacturer Cardinal joined forces to develop an early, compact chess computer.

• The Software: The basis of their machine was the chess program written by David Lindsay. David Lindsay was a talented programmer who had written an extremely efficient chess algorithm that could run on a relatively simple microcontroller.

• The Hardware: Mostek did not supply the MOS 6502 processor, but used the Fairchild F8 architecture for this project (Mostek produced these F8 chips under license under the name Mostek 3850). Mostek built the hardware around this F8 chipset to run David Lindsay's program.

• The Housing & Market: Cardinal Industries took care of the physical design and distribution. The goal was to bring an affordable, portable device to the market.

How this led to the famous "BORIS"

This particular project between Mostek, Cardinal and programmer David Lindsay gained momentum in 1976/1977, but changed its commercial format. The technology (the Fairchild F8/Mostek hardware with David Lindsay's software) was eventually licensed or transferred to the Applied Concepts company. They commercialized this technology in 1977/1978 under one of the most iconic names in early computer history: BORIS (and later the Boris Diplomat). This computer became famous for sending sarcastic or encouraging text messages to the player via an LED screen while playing ("GOOD MOVE", "ARE YOU SURE?").

The link to BORIS

Since the Chess mate ran on the Fairchild F8 microprocessor (manufactured under license by Mostek) at the time, it is crystal clear why David Lindsay was the perfect man for the job. After all, shortly thereafter, he used that same F8 processor for his iconic work on the Applied Concepts / Chafitz BORIS, which hit the market in February 1978.

The code transition

This perfectly explains how he was able to take his chess algorithm (and the expertise he had gained with the F8 architecture) with him to Applied Concepts when the project at Cardinal and Mostek stalled.

Paper tapes and the Teletype 33

An acquaintance of Lindsay (via @joemonktx on YouTube) described how the programmer assembled the code by hand, connected it using wire-wrapped boards, and loaded it into the development computer via paper tapes; this paints a wonderful, unique picture of the pioneering days of microelectronics. It is fascinating "computer archaeology."

His programming style

People who saw him at work back then (as described on the Hiarcs forum by old acquaintances) recall that he assembled his code by hand. The original BORIS was unique because Lindsay opted for 2KB of Static RAM instead of Dynamic RAM; this greatly simplified the hardware design at the time (and explains the infamous 'Reset' button used to manually clear the RAM).

Mostek Corporation's Historic Missed Opportunity
With its 1976 prototype, Mostek held a golden opportunity to completely outclass Fidelity Electronics (which did not unveil its first model until January 1977). The exact reason why the Mostek/Cardinal "Chess mate" never reached the retail market was never disclosed in an official press release. However, three crucial factors typically come into play in such early computer projects.

The transition to Applied Concepts (BORIS)
The most immediate reason was a shift involving the human element: David Lindsay. When the project stalled at Mostek and Cardinal Industries, Lindsay did not sit idly by. He took his expertise (and the foundation of his chess algorithm for the Fairchild F8 microprocessor) with him to Applied Concepts. There, he received the green light and the necessary resources, resulting in the February 1978 launch of the legendary Chafitz BORIS. In effect, the intellectual capital behind the Chess mate migrated to a competitor.

Strategic hesitation among chip manufacturers
At the time, companies like Mostek were primarily chip manufacturers, not producers of toys or consumer goods. They often built prototypes (such as the Chess mate shown at the toy fair) purely as demonstration models to showcase the capabilities of their new microprocessors (like the F8), hoping that other manufacturers would purchase their chips in large quantities. If a collaboration with a toy partner like Cardinal Industries hit a snag, or if projected production costs seemed too high (the target price of $120 was a significant sum back then), a chip giant would quickly pull the plug on the consumer venture to refocus on its core business.

Commercial cold feet
In 1976, the market for commercial chess computers simply did not yet exist. While Sidney Samole at Fidelity possessed the vision and the willingness to take the immense entrepreneurial risk of diving headfirst into this new market, the management teams at Mostek and Cardinal likely failed to see sufficient market potential in a "calculator that plays chess" at the time. They viewed it as a mere niche, and consequently missed the boat entirely.

It remains a fascinating historical mystery
Had Mostek shown just a little more daring back then, the Chess mate (not the Chess Challenger) would have been the world's very first commercial chess computer.

Hein Veldhuis: Just a quick note. Mostek Corporation and Cardinal Industries simply lacked the distribution power that Fidelity later commanded. Perhaps it also had to do with Lindsay's early F8 code from 1976, which simply had too many "teething troubles" for a flawless market launch.

What else do we know about Cardinal Industries?
Cardinal Industries (now known as Cardinal Games) is one of the oldest and most iconic traditional game manufacturers in the United States. Although they intended to launch the electronic "Chess mate" in collaboration with Mostek, their true origins lie in a completely different sector of the toy market.

The Origins: From Carnival Wheels to Dominoes
The company was founded in 1944 by Les Berger in a small loft in Brooklyn, New York. In its early years, Cardinal produced large wooden carnival wheels (wheels of fortune) for county fairs and bazaars. Between 1945 and 1948, they changed course and began molding plastic dominoes and poker chips. This proved to be a massive success: Cardinal quickly became the undisputed market leader for domino sets in the US.

The Focus: Traditional Games and Distribution
Cardinal did not produce complex game mechanics itself; instead, it specialized in the mass production and distribution of classic, "non-patented" tabletop games. For decades, their catalog consisted of familiar staples: chess, checkers, backgammon, bingo, mancala, and Mahjong. Regarding their standard chess sets, Cardinal often acted more as a distributor than a manufacturer. For instance, they imported exquisite wooden and brass chess pieces from Italy (Italfama) to sell in American stores under their own brand name. They knew exactly how to get a traditional game into an attractive, affordable box and onto store shelves on a mass scale.

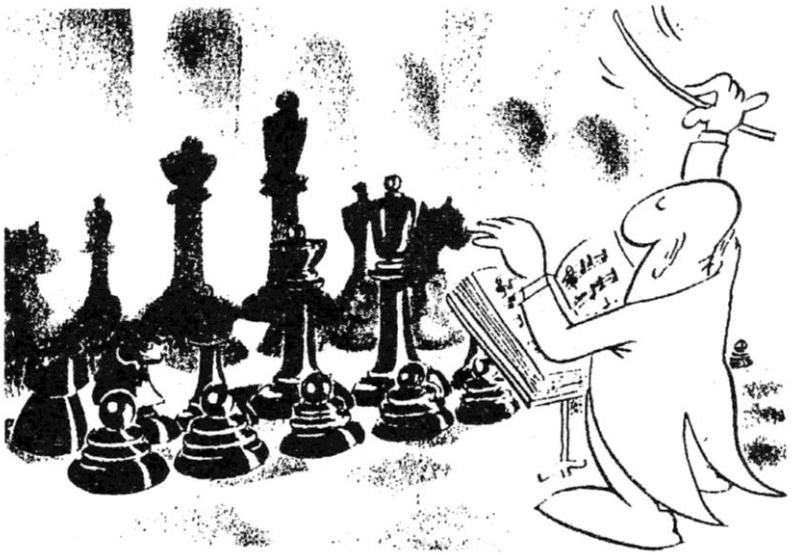
The Move and the "Licensing Boom" (1976)
In the very year the *Chess mate* was being developed, Cardinal underwent a major change: they relocated their headquarters and factory from Brooklyn to a larger facility in Long Island City, New York. Around that same time, they discovered a new goldmine: licensing. Instead of producing only basic games, they began creating board games based on popular TV shows and Hollywood brands (such as *The $25,000 Pyramid* and *General Hospital*). This also explains why they were open to collaborating with a chip giant like Mostek; in 1976, Cardinal was actively seeking innovation to modernize its traditional image.

Acquisition by Spin Master (2015)
The company remained a successful family-run business under the Berger family well into the 21st century. In 2015, it was finally acquired for a staggering $50 million by the Canadian toy giant Spin Master. The Cardinal brand name is still used today for puzzles and board games, and their former home base in Long Island City now serves as the strategic gaming hub for Spin Master East.

In 1976, Cardinal Industries was an established giant in cardboard, wood, and molded plastic, boasting a rock-solid distribution network across American toy stores. They could have been the perfect partner to get a chess computer into every American household. However, because they had zero experience with microelectronics and relied on Mostek for the hardware, the project was vulnerable to the chip manufacturer's strategic decisions.

Why the collaboration between Cardinal Industries and technology firm Mostek fell apart

When a large, traditional plastics and games manufacturer (Cardinal) and one of America's major microchip pioneers (Mostek) joined forces in 1976, it seemed like a match made in heaven. Yet, the fact that the "Chess mate" never reached the market was the result of a classic clash of cultures, logistical cold feet, and a lack of experience with what was then brand-new technology. The story of why this collaboration failed boils down to three main causes:



"Outsourced Assembly" and Quality Control

A historical source from May 1976 (Kreuzqualle / Berlin Chess Club) contains a crucial phrase: "Cardinal Industries Inc. [...] plans to hire an assembler for the unit." This immediately pinpoints the problem: Cardinal did not possess the facilities to assemble microelectronics itself. They had to hire an external party (a contract manufacturer or assembler) to solder together the delicate F8 chips, circuit boards, and LED displays. In 1976, consumer microelectronics were incredibly complex. Outsourcing entailed huge risks regarding quality control and defects. In all likelihood, the costs associated with failure rates or the quotes from these external assemblers turned out to be far higher than the intended retail price of $120.

Mostek's Role: Demonstration vs. Mass Production

In 1976, Mostek was a chip giant locked in cutthroat competition with Intel, Zilog, and Motorola. Their core business was selling millions of silicon chips to computer manufacturers, not selling toys. For Mostek, the "breadboard" prototype shown at the New York Toy Fair was primarily a marketing tool designed to demonstrate the power and versatility of their Fairchild F8 architecture. Whenever a project with a toy partner faced delays or began demanding too much management attention, the tech giant's executives would quickly withdraw their support; after all, they preferred to sell F8 development kits directly to parties capable of immediate production.

The Missing Link: The "Samole Factor"
The major difference between Cardinal Industries and Fidelity Electronics was the presence of a driven visionary. Cardinal was accustomed to the stable, low-risk margins associated with plastic dominoes and cardboard board games. When faced with the uncertainties and teething troubles of David Lindsay's early prototype, they got cold feet regarding the commercial prospects.

Sidney Samole (Fidelity), on the other hand, was an entrepreneur willing to take a leap of faith and transform his entire company to be the first to market. Cardinal lacked that technological drive and simply viewed the project as a failed detour in their product catalog.

How It Ended: David Lindsay's Success
When the partnership between Mostek and Cardinal faltered, David Lindsay decided not to wait around. He purchased (or retained) an official F8 development kit from Mostek. Instead of pinning his hopes on Cardinal, he approached Applied Concepts / Chafitz. They provided the necessary budgets and production lines to complete his F8 code. Because Applied Concepts gave him access to 2KB of Static RAM (which greatly simplified the hardware design compared to the Chess mate) he was ultimately able to triumph with the launch of BORIS in February 1978.

Cardinal and Mostek missed a historic opportunity to beat Fidelity to the punch. Yet, without that failed collaboration, David Lindsay might never have had the impetus or the expertise to build the iconic BORIS.

The Domino Factory
For decades, this was the absolute core of their business. When Les Berger founded Cardinal Industries in 1944, they started on a very small scale, but from 1945–1948 onwards, they invested heavily in large injection-molding machines to produce plastic domino tiles. In the ensuing decades, their factory (initially in Brooklyn and, from 1976, in Long Island City, New York) grew into a veritable domino metropolis. They produced millions of sets annually: ranging from classic black-and-white tiles to the well-known Double Nine and Double Twelve sets in iconic tin boxes. In doing so, Cardinal became the largest domino manufacturer in the United States.

It is precisely this contrast that makes the historical story so compelling!
- On one hand: Cardinal, a company that thought in terms of tons of plastic pellets, injection molds, heavy presses, and the logistics of millions of traditional domino tiles and cardboard boxes.
- On the other hand: Mostek and David Lindsay, working at the level of square millimeters with microscopic silicon wafers, delicate Fairchild F8 microprocessors, and abstract computer code.

When Cardinal decided to market the "Chess mate" in 1976, they were essentially attempting to bridge the gap between the familiar world of plastic molding and the unfamiliar, hyper-sensitive realm of microelectronics. Since their own New York factory was completely unequipped for this, they had to seek out an external assembler. The fact that a renowned domino giant came close to releasing the world's very first commercial chess computer is a wonderful, ironic historical detail!

David Lindsay's Micro-architecture

It is a fantastic piece of computing history: Lindsay wrote that entire groundbreaking chess program in the 1970s on an F8 development kit he had received from Mostek. He managed to build a functional chess AI that fit into just 2.5 KB of ROM and operated with a tiny 256 bytes of RAM. The "Chess mate" prototype was developed using hardware from Mostek (which produced the Fairchild F8 architecture as a second source), and Lindsay worked with exactly 256 bytes of working memory (RAM).

The Unique F8 Architecture (No Address Bus!)
The Fairchild/Mostek F8 processor was an outlier. Unlike the Z80 or the MOS 6502, the F8 chip itself lacked a traditional 16-bit address bus. Memory addressing was handled by peripheral chips (such as the 3853 Static Memory Interface). Because the processor could not directly address memory in the conventional way, every write operation to that 256 bytes of RAM was a costly process in terms of instructions and CPU cycles.
Lindsay had to structure his data so that the processor needed to switch between the RAM and the chip's internal components as infrequently as possible.

The Scratchpad as 'Turbo' Memory
The F8 processor had a major advantage: an internal scratchpad memory consisting of 64 registers (bytes) built directly into the CPU architecture. Lindsay made masterful use of this feature. The actual 256 bytes of external RAM were reserved strictly for the bare essentials: the current chessboard position and the minimal game state. The calculations themselves (depth counters, alpha-beta bounds for move-tree pruning, and temporary piece evaluations) took place entirely within the 64 scratchpad bytes on the chip. This prevented the external RAM from becoming overloaded.

The BORIS Chess Program in 1978
When David Lindsay was commissioned to write the software for the legendary BORIS (born out of early F8 development projects), he faced a massive puzzle. The Applied Concepts hardware consisted of a Fairchild/Mostek F8 microprocessor with 256 bytes of RAM and a mere 2.5 KB of ROM. Here is exactly how he tackled the two biggest challenges: Boris's talking 'personality' and squeezing maximum performance out of the F8 architecture.

What made programming within 256 bytes of RAM even more impressive was that BORIS didn't just play chess; it also communicated. The device featured an alphanumeric display that showed messages while the computer was 'thinking,' such as "I EXPECTED THAT," "HAVE I LOST?" or "GOOD MOVE." To achieve this with so little RAM, not a single byte of text-related data could be wasted. The text strings were tightly encoded within the 2.5 KB of ROM. In RAM, only a single byte was sacrificed to serve as a 'pointer' or 'flag,' determining which emotional response the computer should display based on its evaluation of the board.

Sacrificing bits for the board
As with the earlier concept, the 64-square chessboard had to be stored as compactly as possible. The board took up a significant chunk of the 256 bytes of RAM. By reducing each square to half a byte (4 bits), he managed to fit the status of the 32 pieces and the empty squares into a very tight data structure, leaving just enough room for the stack (the memory the computer uses to keep track of its position while calculating deeper moves).

Stuffing the 'personality' into the ROM
Boris was unique because he 'lived'. He wasn't a cold calculator; he commented on your game via his alphanumeric display with phrases like "IMPRESSIVE", "HAVE I LOST?", or "ILLEGAL MOVE, SPOT". How do you cram dozens of text strings into a system with virtually no memory? If you store text as standard ASCII characters, each letter takes up 1 byte (8 bits). A sentence like "I EXPECTED THAT" immediately consumes 15 bytes. Do that a few times, and your 2.5 KB ROM is packed full before a single chess rule has even been programmed. Lindsay solved this with two ingenious tricks!

Bit-shaving (Stripped-down ASCII)
The computer only needed to display uppercase letters, spaces, and a few punctuation marks. A standard ASCII table uses 7 or 8 bits per character to support 128 to 256 characters. Lindsay designed a custom 6-bit character set ($2^6 = 64$ possible characters). This allowed him to store each letter using just 6 bits instead of 8. By packing these bits tightly together, he immediately saved 25% on the total text size in the ROM.

The RAM-flag architecture
The working memory (RAM) absolutely could not be burdened by the text strings. Lindsay reserved only 1 or 2 status bytes for the interface within the 256 bytes of RAM. If the computer was calculating and its score suddenly dropped drastically, the chess algorithm would change this status byte to, for example, the value 0x04. The display routine in the ROM read this value, recognized that 0x04 was associated with a 'panic response', looked up the corresponding 6-bit compressed text block in the ROM, and sent it directly to the display. The RAM thus functioned purely as a microscopic switch.

Maximizing the F8 Scratchpad Registers
To understand how Lindsay made the F8 processor fly, you have to realize just how unusual this chip was. In a standard processor (like the 6502), you might issue a command like: "Fetch the value from RAM address X, add 1 to it, and store it in RAM address Y." With the F8, it wasn't that simple. Because the chip lacked a traditional address bus, communicating with external RAM consumed a vast number of instructions and a great deal of time. Fortunately, the F8 had a secret weapon: 64 internal scratchpad registers (located directly on the CPU). These registers offered lightning-fast access. Lindsay partitioned these 64 bytes with surgical precision:

The ISAR (Indirect Scratchpad Address Register)
The F8 featured a special hardware register known as the ISAR. This allowed for rapid traversal of the scratchpad registers (via auto-increment or auto-decrement). Lindsay configured the initial registers to serve as a local chess stack. Whenever the algorithm needed to look one move deeper (recursion), vital data from the current depth level (such as the depth index, the active player, and alpha-beta bounds) was shifted to the next scratchpad register via the ISAR in a fraction of a microsecond. No slow RAM operations required!

The 'Live' Evaluation Matrix: While the actual chessboard (64 squares) resided in external RAM, the computer had to perform constant evaluations while calculating a move asking questions like "Is my king in check?" or "Which pieces are attacking this square?" During move calculation, Lindsay would temporarily copy the immediately relevant sectors of the board to a small section of the scratchpad. This enabled the processor to execute 'local' bitwise operations on the pieces at top speed, without having to repeatedly access the slow interface to external RAM.

Register sharing
Since 64 bytes is still a tight constraint for a full-fledged chess AI, many registers were assigned dual functions. As soon as the computer finished calculating and it was the human player's turn, the function of the scratchpad registers would instantly change. The very same bytes that had just been used for the alpha-beta search tree were now used to register keyboard input and drive the LED displays.

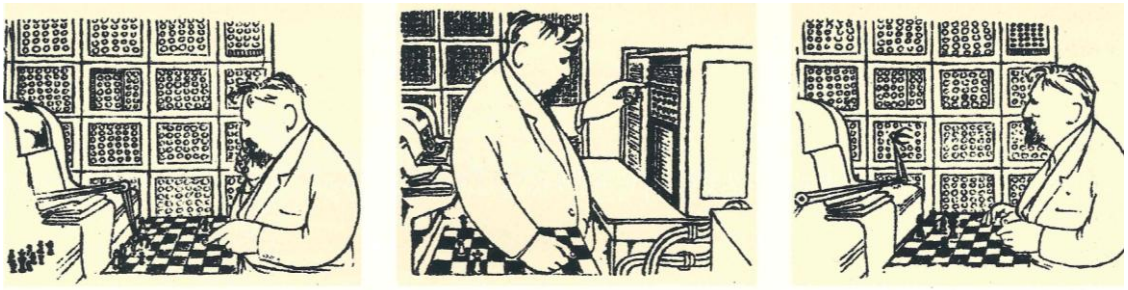
To my taste, the design of BORIS in the wooden box is a 100% success!
The scent of the box alone is almost addictive!

The result of this ingenuity
By handling the heavy computational work and recursion entirely within the physical core of the F8 chip (the scratchpad), the system kept the 256 bytes of external RAM virtually free of data traffic. The RAM only needed to store the static state of the board and vital game parameters.

It is this synergy of pure hardware architecture that enabled the Chafitz Boris (launched in Februari 1978) to become not only one of the very first commercially successful chess computers but also a legendary machine that gave many a micro-chess computer (equipped with far more memory) a run for its money in tournaments.

David Lindsay: A true pioneer!

It is fascinating how someone who left such a significant mark on the early history of microcomputing has simultaneously remained one of the most mysterious figures in computer archaeology. Historical sources and official databases offer remarkably little information about David Lindsay as an individual. Nevertheless, by piecing together accounts from acquaintances and colleagues of that era, along with his patents, it is possible to reconstruct a brief outline of his background.



'Don't be so sure of yourself!' *... I can always push a button...* *... and you will lose. ("Świat").*

Background and Biography

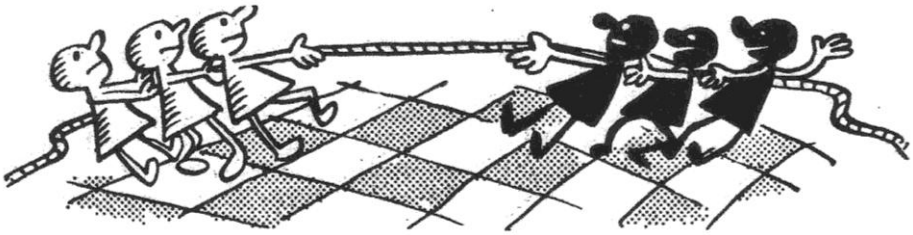
David Lindsay was born in England. Many early American sources referred to him as an "American programmer" because he lived in the thriving tech region around Dallas and Garland, Texas; in reality, however, he was a British immigrant who had moved to the United States. During his heyday as a chess programmer in the 1970s, he lived and worked in Dallas, Texas. His exact date of birth and current age are not publicly known. Given that he was already a seasoned programmer working independently on complex microprocessors in 1976, it is estimated that he was in his early thirties at the time. This would mean that (assuming he is still alive) he would now have just passed the age of eighty.

The Man Behind the Code

A unique glimpse into his life comes from a personal friend and fellow member of the same church community in Texas. Beyond programming, Lindsay was a highly musical man; he sang in the local church choir alongside his wife. Friends who visited his home back then witnessed him developing the legendary BORIS computer literally at his kitchen table. To do this, he used an early Fairchild F8 development kit he had obtained through the chip manufacturer Mostek. At the time, the BORIS featured a secret built-in mechanism (a 20mA TTL current loop). Lindsay programmed it in such a way that he could connect an antique teletype machine (a typewriter-style terminal) to the chess computer at home, allowing him to read out the code in real-time during testing.

His Creative Legacy

Lindsay was not merely a programmer focused on the math; he was also involved in the design. In 1978, he filed an official US patent (US D255247) for a "Chess piece font." With this, he designed the specific graphical representation of the chess pieces on the early displays of the Boris Diplomat. Following the release of the Boris Master and Boris Diplomat in 1979, Applied Concepts handed the baton to the renowned programming duo Dan and Kathe Spracklen (famous for Sargon). From that point on, David Lindsay largely faded from the chess world's spotlight. Even the son of the founders of distributor Chafitz later admitted: "We hired him back then, but unfortunately, we don't know much about him as a person." It is a classic story of a brilliant pioneer who remained permanently in the background due to the looming competition from Dan and Kathe Spracklen.



David Lindsay and the Teletype Model 33 ASR (Automatic Send and Receive)

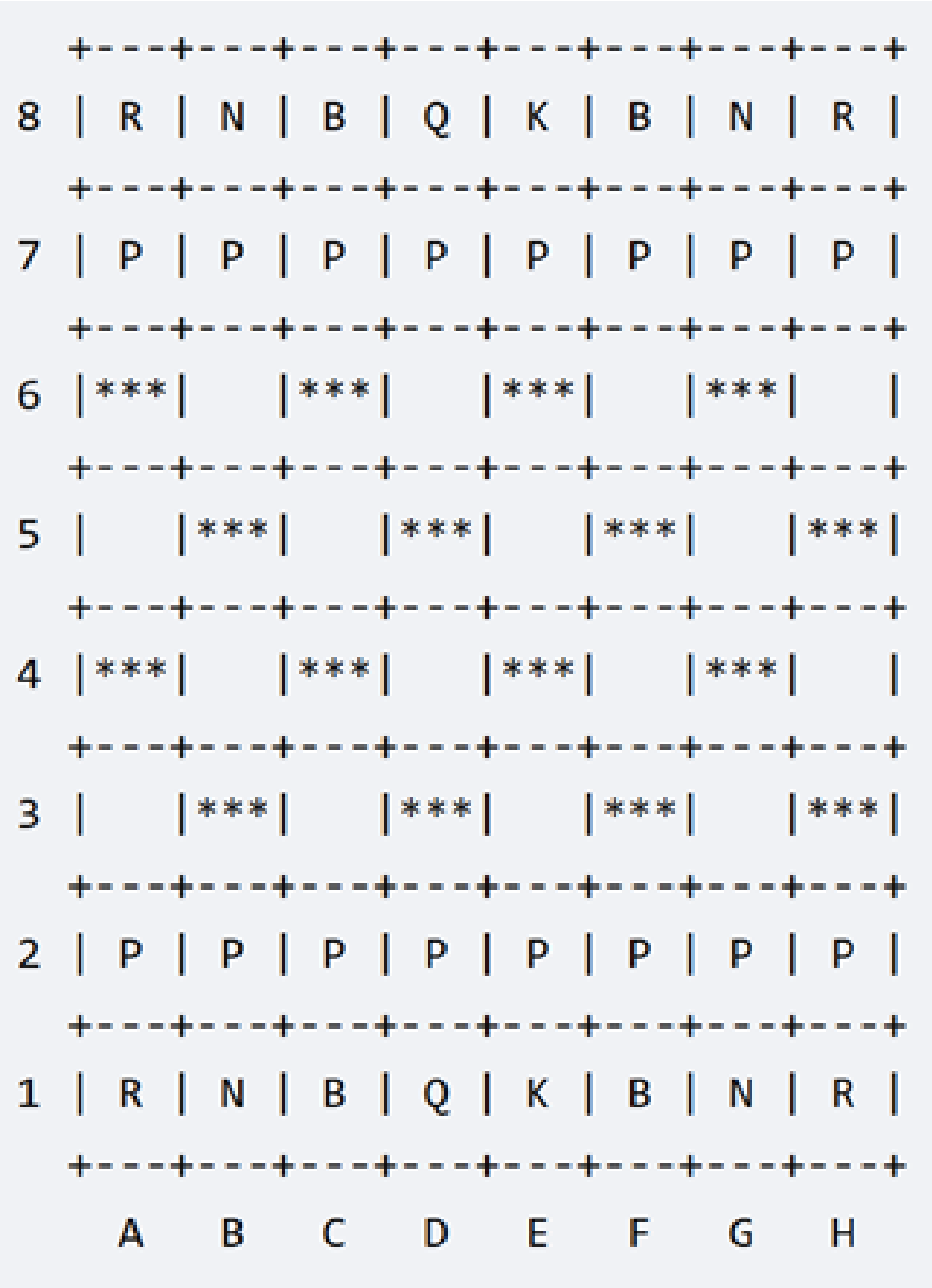
The "Chess mate prototype" (from 1975/76) ran on a Fairchild F8 microprocessor, and Lindsay had to cram his chess algorithm into just 2.5 KB of ROM and a microscopic 256 bytes of RAM. Because the external RAM was slow and lacked a traditional address bus, he programmed the calculations (such as alpha-beta pruning) directly into the CPU's 64 internal scratchpad registers. The fact that Lindsay worked on his chess code using a Teletype machine is a fascinating detail! It perfectly illustrates just how creative pioneers had to be given the limited resources of that era. As a programmer, he wrote code (often in assembly or early computer languages) for microprocessors like the Fairchild F8. Since these chips lacked built-in displays or input methods, the Teletype 33 was the ideal machine for typing in the code and sending it to the test system via the paper tape reader. Later, the paper tape could be fed through the reader to transmit the code to the computer at lightning speed (a rate of 10 characters per second).

A wonderful example of the Teletype Model 33 ASR in operation can be seen in this video:
https://www.youtube.com/watch?v=S81GyMKH7zw

The Teletype was used for chess programs in two ways at that time:

1. As a programming terminal: To write and store the code of the chess algorithm on paper tape.
2. As an interface to the game: To make a move, the player would type, for example, E2E4 on the keyboard. The computer thought about it and after a while started noisily hammering the countermove onto the paper (e.g. E7E5). Some early programs even printed out an entire 'chart' of the chessboard after each move, using letters and numbers (such as P for pawn, R for rook) to show the current position.

The printed chessboard on a Teletype looked as shown below:



The chess pieces were simply designated by their initial letters (Rook, Knight, Bishop, Queen, King, Pawn). Since the printer lacked color capabilities (and often used only black ink), some programs used uppercase letters for White and lowercase letters for Black. However, because the Teletype 33 supported only uppercase characters, programs often resolved this by placing a plus sign or asterisk after a letter (e.g., P* for a black pawn) or by simply indicating whose turn it was with a W or B. Each time the computer calculated a move, the Teletype would begin to clatter and hammer furiously to print the diagram onto the paper, line by line. Consequently, a game of chess was a rather noisy affair back then!

The work Lindsay did on these machines at the time eventually led to the legendary Boris in 1978 (distributed by Chafitz). It is fascinating to consider that the foundation for that portable computer was laid on a noisy, mechanical Teletype machine.

From Teletype to the Chafitz "Boris" (1978)

The original Boris computer even featured a physical port on the back (a so-called 20mA current loop) that allowed you to connect it directly to a Teletype! When Boris hit the market via Chafitz in 1978, however, the consumer no longer needed that clattering Teletype terminal. Instead, the machine was equipped with a small 8-digit LED display that showed the moves (such as E2-E4).

What made Boris legendary at the time (and what Lindsay had undoubtedly programmed into it with a sense of humor) was that the microcomputer would scroll random, sarcastic, or encouraging text messages across the display while "thinking." For instance, while analyzing your move, messages like the following would appear:

- I EXPECTED THAT
- ARE YOU SURE?
- CONGRATULATIONS

How good was Boris at chess?

In 1970s marketing, Boris was described as a "computer grandmaster," but in reality, its playing strength was extremely limited. Boris had a playing strength of approximately 1000 to 1100 Elo. This meant the computer could easily beat an absolute beginner or an average casual player, but a club player or advanced player would beat it effortlessly. Boris was programmed to think in highly material terms. Tactically, he could occasionally spring a surprise (playing at a level of around 1400 Elo), but his positional understanding was very weak (around 800 Elo). For instance, he was obsessed with pawns and would easily fall for obvious traps. His playing strength depended entirely on the time limit set on the timer. At the lowest levels, he would respond within a few seconds and commit massive blunders. If set to the highest level, he might ponder a single move for hours (or even days). This made the game unplayable, and (unfortunately) it didn't make him much stronger, as the hardware simply lacked the necessary computing power. Nevertheless, the market was completely captivated. Even the legendary world champion Bobby Fischer was so fascinated by the device that he personally called the importer, Chafitz, to express his admiration.

His very last project: the BORIS Grandmaster with the "fully electronic" board

One of the most fascinating, rare, and almost mythical chapters in the early history of computer chess is undoubtedly the BORIS Grandmaster! It bears repeating that it is a misconception to think the BORIS chess computer models had any connection to the former World Chess Champion Boris Spassky. B-O-R-I-S is simply an acronym for: Basic Operational Recreational Instructional Systems! The name BORIS was chosen by Applied Concepts/Chafitz to give the chess computer a recognizable, human identity. While marketing materials sometimes played on the association with Boris Spassky, there was officially no direct link to the world champion.

The BORIS Grandmaster was developed in 1979, with the prototype becoming operational in September of that same year. The BORIS Grandmaster was poised to go down in history as the world's first fully electronic chess computer. Instead of physical pieces on a wooden board, the entire chessboard was designed to be displayed electronically, using graphic symbols to indicate the positions of the pieces. A special switch allowed the user to choose between viewing the current position in real-time or watching the inner workings of BORIS's "brain" as it calculated its next move!

BORIS Grandmaster

»Solid walnut case. Size: 15½" x 10" x 3½" (39.3 cm x 25.4 cm x 8.7 cm)«

Same advanced features as Boris Master, plus exclusive full electronic board display. No chess pieces needed! The entire chess board is displayed electronically with graphic symbols showing the location of each piece. Special selector switch allows you the choice of viewing the current board situation or watching Boris' brain move the pieces electronically while he considers his next best move. In battery mode, only single integrated panel display operational; Position Storage Memory for interrupting game at any time operates at all times.

The machine was housed in an extremely luxurious, solid walnut case of substantial dimensions (approx. 39 x 25 x 9 cm). The software in this prototype (and likely in some pre-production models as well) represented the absolute pinnacle of Lindsay's programming work for Applied Concepts/Chafitz. Lindsay took the core functionalities of the BORIS Master (including battery mode and the Position Storage Memory feature that allowed a game to be paused and resumed later) and tweaked the engine to its absolute limit within the F8 architecture. It was already known at the time that the F8 processor had reached the limit of its computing capacity.

BORIS Grandmaster Remained a Prototype Forever

The BORIS Grandmaster never entered mass production because, at the last minute, Applied Concepts changed its approach to the development and manufacturing of chess computers. By the autumn of 1979, the company was already working behind the scenes on the Modular Game System (MGS), which was set to launch in December 1979 featuring the much more powerful Sargon 2.5 module by Dan and Kathe Spracklen.

For serious chess computer collectors (those still seeking unique and extremely rare models from the past) this machine represents the ultimate "Holy Grail" to add to their collections. It remains to be seen whether a BORIS Grandmaster will ever appear for sale on eBay or elsewhere.

BORIS

BORIS IS KING ©

DIE BORIS – SCHACHCOMPUTER – SERIE 79

BORIS das beliebte Standardmodell, mit Netzteil 220 Volt **DM 898.–**

- o über 100 Schwierigkeitsgrade
- o ideal zum Lernen durch stufenlose Anpassung
- o echte Figurendarstellung auf Display 8 stellig
- o gibt bis zu 80 schriftliche Kommentare in Englisch
- o analysiert Schachprobleme (z. B. Matt in 3 Zügen)
- o erhabene leichtgängige Tastatur
- o spielt schwarz oder weiss
- o kinderleichte Spielstandskontrolle oder Korrektur
- o kompakt untergebracht mit Raum für Zubehö in der Kassette
- o denkt bis zu 8 Züge voraus

Edelholzgehäuse Masse ca. 24 x 17 x 9 cm

o BORIS MASTER hat zusätzlich AKKUBETRIEB + SPEICHER DM 1198.–

Alle Funktionen wie BORIS und zusätzlich:

- o eingebaute aufladbare Akkus für ca. 8 Std. Spielbetrieb
- o Speicher, der im ausgeschalteten Zustand eine Brettposition bis zu einer Woche festhält, damit kann man ein Spiel, das unterbrochen wurde, zu beliebiger Zeit fortsetzen.

Edelholzgehäuse Masse ca. 27 x 16 x 10 cm

o BORIS GRANDMASTER mit VOLLELEKTRONISCHER Spielfeldanzeige DM 2998.–

Alle Funktionen wie BORIS und MASTER und zusätzlich:

- o Vollelektronische Spielfeldanzeige, keine Figuren mehr nötig !!
- o Jede Figur ist optisch abgebildet und kann konstant oder
- o während der "Denkphase" in schneller Bewegung betrachtet werden

im Batteriebetrieb ist die volle Anzeigefläche abgeschaltet wegen des hohen Stromverbrauchs.

Edelholzgehäuse Masse ca. 40 x 25 x 9 cm

x BORIS DIPLOMAT der kleine Reisebegleiter mit BATTERIEBETRIEB !! ca. DM 448.–

hat alle Funktionen wie BORIS, gibt aber keine Kommentare und hat ein 8 stelliges aber vereinfachtes Figurendisplay. Die Spielstärke ist etwas langsamer als die von BORIS.

- o Batteriebetrieb mit Mignonzellen ca. 12 Std.
- o Netzbetrieb mit Adapter.

Kunststoffgehäuse Masse ca. 20 x 17 x 3 cm

Alle BORIS Modelle im Edelholzgehäuse sind handverarbeitet !!

o = auf Sonderbestellung, Lieferzeit ca. 8 Wochen x = lieferbar voraussichtlich ab ENDE Juni 1979

BORIS setzt Masstäbe in der Schachcomputer-Entwicklung !!!

BORIS ist immer voran: Im Dezember 78 schlossen sich die besten Programmierer der Welt für Schachcomputer (programmierten den riesigen CHESS 4,7) Slate und Atkin dem BORIS Team an!

BORIS brachte die neuentwickelte 8 stellige Symbolanzeige
BORIS brachte den stufenlos einstellbaren Timer
BORIS brachte die aufheiternden Kommentare in Laufschrift
BORIS bringt den ersten Heim-Schachcomputer mit Akkubetrieb
BORIS bringt den ersten Heim-Schachcomputer mit VOLLER Spielfeldanzeige
BORIS bringt den ersten Heim-Schachcomputer mit 8 Tage Speicher
BORIS bringt den ersten Reise-Schachcomputer mit Batteriebetrieb

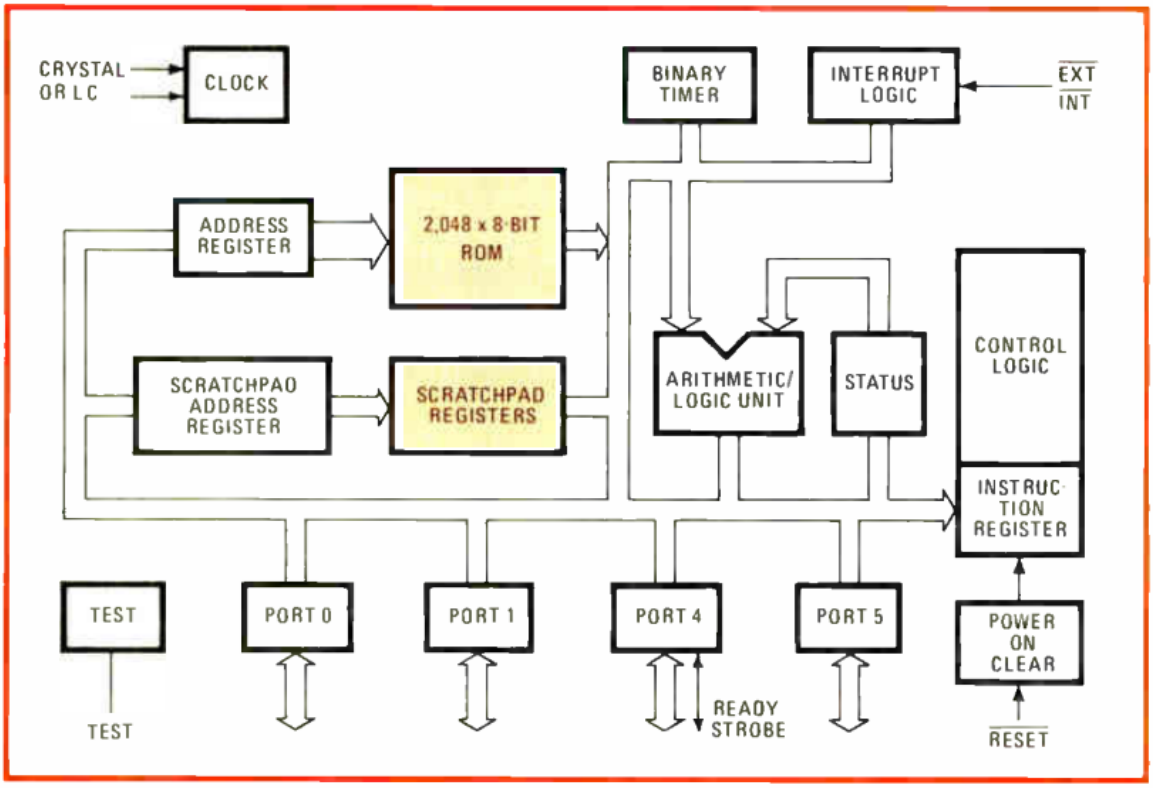
SANDY EXPORTS

Leopoldstr. 79
8000 München 40
Tel. 089/ 39 82 46

Applied Concepts/Chafitz & Sandy Exports - 1979

Mostek readies one-chip F-8 . . .

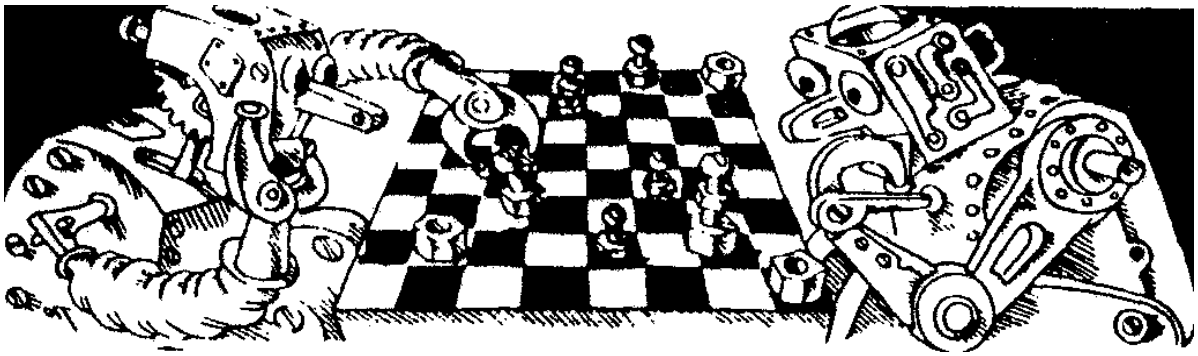
In the race for the low-cost microprocessor dollar, Mostek Corp. has managed to put its two-chip version of the F-8 microprocessor onto a single chip. What's more the company has doubled the program capacity to 2 kilobytes, as well. Users will also be thankful for the capability of the new MK3870, or F-8/1 as it's called, to operate from a single +5-volt supply, instead of the usual +5-v and +12-v levels. Major users for



New chip in town. Mostek's one-chip F-8 has a 2-kilobyte ROM and extensive scratchpad facility to increase performance at about half the price of two-chip version.

Mostek readies one-chip F-8

Source: American trade journal *Electronics* – November 1976
https://www.worldradiohistory.com/Archive-Electronics/70s/76/Electronics-1976-11-25.pdf



same controller market where the two-chip F-8 has found its niche, as well as in the lowest levels of control applications.

Ion implant. The part's density has been increased largely by programing the read-only memory with a new ion-implantation technique instead of conventional selective-diffusion or oxide-etching methods. Even with the large-capacity program store, chip size "will be well under 200 mils on a side," says Robert F. Schweitzer, marketing manager for the F-8. Each chip in the two-chip version measures about 175 mils on a side. (The family, which was oped by its prime supplier, Fairchild Camera and Instrument Corp., will also be supplied by Motorola Semiconductor under a recently concluded technology exchange agreement with Fairchild [*Electronics*, Nov. 11, p. 30].)

"Our primary goal was to be able to run the part with the same [program] codes as the multichip F-8s," says Robert Cook, microcomputer products manager for the Carollton, Texas, firm. "And we can—the part is both hardware- and software-compatible with the existing F-8 family." Further, the ion-implantation of the ROM program comes late in the firm's standard n-channel process. This enables Mostek to stockpile partially processed wafers, cutting turnaround time to the customer.

Ceramic-packaged parts, are scheduled to be offered as samples in late February or early March. But Mostek plans production of plastic-packaged versions in the second quarter that will sell for $10 each in lots of 1,000—about the cost of each chip of the two-chip type. Parts packaged in ceramic will probably sell for $3 or $4 more.

Mostek also plans to put development tools in customers' hands. In January it will start selling the Mini-Emulator, a printed-circuit card containing all the circuitry, including programable ROMs, for emulating the F-8/1. Also in February, Mostek will have a new application interface module to debug F-8 software. The output of each will be a 40-pin connector designed to plug into MK3870 sockets. □

. . . Fairchild moves ahead on F-8 line

While Mostek concentrates on an ambitious one-chip F-8, Fairchild Camera and Instrument Corp., the microprocessor family's prime source, is planning upgraded versions of its original designs and a one-chipper as well. According to Van Lewing, microprocessor marketing manager at the Mountain View, Calif., semiconductor firm, Fairchild plans to introduce new F-8 one- and two-chip configurations to complement the existing 3850/51 chip by the middle of 1977.

Scheduled for January are two new versions of the 3851 program-storage unit, both containing a 2,048-by-8-bit read-only memory/programable ROM on chip. The 3856 will have the same input/output capability as the 3851, while the 3857 will give up the I/O capability to bring out the bus, so external peripherals may be added to the F-8 system. Like the 3850/51, these will require +5- and −12-volt power supplies.

The cheaper one-chip version of the 3850/51 chip set is due in March, says Lewing. Designated the 3859, it will contain 1,024 bits of ROM or PROM and 32 bits of bidirectional TTL-compatible I/O. It will also require +5- and −12-v power supplies. Following this is a device comparable to Mostek's—a single-chip +5-v version, with 2 kilobits of ROM or PROM on chip, the 3860. It will be identical in virtually every way to Mostek's 3870.

Existing users. The 3859 one chipper, says Lewing, is aimed at existing users of the two-chip 3850/51. The 3859 will sell for about $8 in volume, versus the $12 for the 3850/51 chip set, he says. The 3860 (and the 3870, for that matter, Lewing says) is aimed at a sophisticated controller market requiring 2 kilobits of ROM or PROM on chip but not extensive I/O capability. In volume they drop to about $10.

The 3850/3856 and the 3850/-3857 combinations are aimed at a more sophisticated controller market requiring, typically, twice as much ROM/PROM capability, as well as some system design flexibility. This is a three-chip solution where the user requires extensive I/O capability. For anywhere from $15 to $30 in volume, such a user would use the 3857 with the 3850 to give him external bus capability and then add either standard memories or 3856s.

Low end. "Basically we are trying to cover all the possible requirements of the low-end, high-volume controller market," Lewing says. "And you don't do this with a carved-in-concrete one-chip approach. What is needed is a family of chips flexible enough to meet a number of different cost and design constraints."

He points out that the F-8 uses a process identical to Mostek's Isoplanar n-channel depletion-load MOS. Depletion-load is what allowed designers to go from three power supplies to two power supplies. To get the +5-v supply, designers had to go to an on-chip substrate biasing technique similar to that used first in Intel's 2115 high-speed MOS RAM and later in Zilog's Z-80 microprocessor. He points out that though the Mostek chip is an essentially independent development, the 3860 and 3870 are almost the same. □

Mostek readies one-chip F-8

Source: American trade journal *Electronics* – November 1976
https://www.worldradiohistory.com/Archive-Electronics/70s/76/Electronics-1976-11-25.pdf

The BORIS chess computer in the wooden case

Introduced in February 1978 by Applied Concepts and distributed by Chafitz, the BORIS chess computer is one of the most iconic and charming devices from the early history of computer technology.
While other early chess computers were cold, purely functional devices, BORIS was the very first computer to possess its own "personality." It became a massive sales success even prompting chess legend Bobby Fischer to call in and express his enthusiasm at the time.

Mostek under the hood
As we have already discovered, BORIS ran on David Lindsay's chess program. From a technical standpoint, the computer was cleverly designed for its era, making the most of limited resources:

- The Processor: It ran on a Fairchild F8 8-bit microprocessor. Since Mostek manufactured this chip under license as the Mostek 3850, Mostek's technology formed the beating heart of the machine.
- The Memory: The computer had to make do with just 2.5 KB of ROM (containing the chess program) and an extremely small working memory of only 256 bytes of RAM. It is a technological marvel that Lindsay managed to cram a functional chess program into such a limited space.

A computer with a big mouth
What made BORIS legendary was its built-in blue-green fluorescent display (VFD screen). The computer didn't just calculate its moves; it also interacted with the player via text messages during the game. It could offer encouragement, tease the player, or act arrogantly.
When the player made a move, BORIS might respond with messages such as:

- "IS REWARD READY?" (when it thought it was going to win)
- "GOOD MOVE" (when you made a strong move)
- "I EXPECTED THAT" (when you made a predictable move)
- "ARE YOU SURE?" (when you made an obvious blunder)

For the first time, this gave players the feeling that they were playing chess not against a machine, but against a real 'entity'.

Pure 1970s luxury
Applied Concepts wanted the computer to fit into a stylish living room. Consequently, the original BORIS was housed in a luxurious, handmade walnut case.
The device itself did not feature a built-in sensor chessboard. Instead, it came with a separate, foldable cardboard board and plastic chess pieces. You would make your move on the board and then type it into the computer's keypad (e.g., from square E2 to E4). BORIS would then "think," lights would flash on the display, and it would type out its counter-move, which the player then had to manually execute on the actual board.

The BORIS family
Thanks to its great success, the company released successors in 1979:

- Boris Diplomat (1979): A compact, battery-operated portable version housed in a plastic case with a small peg-in chessboard (one of the very first travel chess computers).
- Boris Master (1979): A more powerful version featuring an improved program and a rechargeable battery, allowing for hours of play anywhere.
- Boris HANDroid (1980): A legendary, exorbitantly expensive masterpiece. This was a chess computer equipped with a real robotic arm. It didn't just "think"; it used a mechanical gripper to physically pick up the chess pieces and move them across the board!

In 1978, BORIS proved that computer chess wasn't just for universities and tech enthusiasts, but could be a commercial mass-market product. In doing so (and aided by Mostek chips) it laid the foundation for the booming electronic games market of the 1980s.

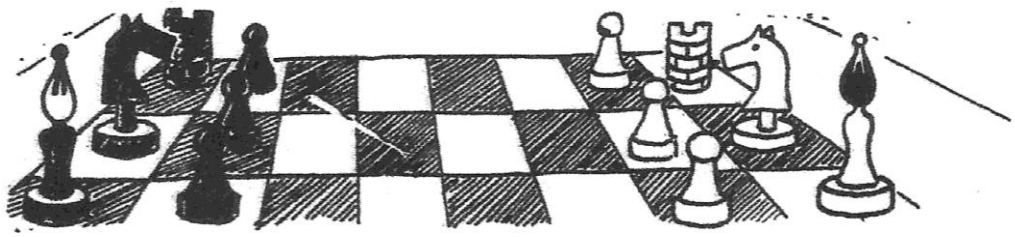
Why the BORIS Grandmaster Was Never Released

The BORIS Grandmaster was never commercially released because, in 1979, Applied Concepts decided to completely overhaul its technology in favor of a modular system. Although a working prototype of the BORIS Grandmaster was ready by September 1979, the project was scrapped at the very last minute due to a strategic shift in direction. There were three main reasons.

1. The arrival of the Modular Game System (MGS)

During that same period (late 1979), Applied Concepts was developing the Modular Game System (MGS). This was a computer console into which separate cartridges (modules) could be inserted.

The BORIS Grandmaster had been designed as an "all-in-one" computer housed in a fixed wooden casing. Applied Concepts realized that a modular system offered significant commercial advantages: consumers would not have to buy an expensive new computer every time; instead, they could simply purchase a separate, less expensive chess module to upgrade the system. The Grandmaster did not fit into this new modular vision.



2. The switch to the Sargon chess program

The BORIS Grandmaster was originally intended to be a more powerful version of David Lindsay's program, combined with new memory functions for saving games. However, in 1979, Applied Concepts acquired the rights to Sargon 2.5, a chess program created by the legendary programming duo Dan and Kathe Spracklen. This Sargon program was far more powerful and superior to Lindsay's software. Applied Concepts decided to stake everything on Sargon. The very first chess module for their new modular computer became the Chafitz Sargon 2.5.

3. The name lived on in another series

Although the specific BORIS Grandmaster computer was shelved, Applied Concepts did not simply discard the prestigious name. The term was later reused for their top-tier chess computers. In the early 1980s, for instance, they marketed high-end, handmade wooden tournament boards (such as the famous Auto Response Board) under the umbrella name "Grandmaster Series" (which accommodated Sargon 3.0 or 4.0 modules).

The "Holy Grail" for collectors

Since the computer was effectively ready for production by the autumn of 1979, a few rare, handmade prototypes of the physical BORIS Grandmaster exist. Among collectors of vintage chess computers, these rare, unreleased Applied Concepts prototypes are considered the ultimate "Holy Grail" today.

Why did the Mostek "Chess mate" never progress beyond the prototype stage?

Its presentation at the New York Toy Fair in February 1976 received extensive coverage in the trade press. The American trade journal *Electronics* published articles on the rise of consumer electronics featuring microprocessors, specifically highlighting the collaboration between Mostek Corporation and Cardinal Industries. These articles detailed how the Fairchild F8 architecture (the Mostek 3850 chip) was utilized to create a portable computer capable of playing chess autonomously. The legendary computer magazine *BYTE* also wrote with fascination about the emergence of such devices at the time. Articles from 1976 cited a projected consumer price of $120, accompanied by the prophetic remark: "Given what happened with pocket calculators, we can expect that in the near future, everyone will be able to afford an electronic chess opponent." The images published in various magazines during 1976 and 1977 clearly reflect the project's prototype status.

The press photos
Black-and-white photos were taken for trade journals at the time. These did not show the "Chess mate" as a sleek, polished consumer product, but rather as an exposed test system a breadboard setup. They revealed a tangle of wires, a test circuit board, the distinctive red LED display segments, and the Mostek microcontroller, all resting on a table beside a physical chessboard.

Drawings and schematics
Instead of glossy promotional photos, the images featured in magazines at the time consisted primarily of flowcharts and technical layouts illustrating how David Lindsay's software interacted with the system's limited computer memory.

Kamikaze Project
It is an almost surreal thought that a technology which sparked such euphoria and media attention in 1976 never reached retail shelves and remained strictly a prototype. Unfortunately, this happened quite often during the pioneering years of computer technology; the leap from a brilliantly functioning laboratory prototype to mass production sometimes proved to be an insurmountable hurdle. It is psychologically almost impossible to grasp that something so revolutionary was cancelled, yet a harsh reality was playing out behind the scenes at the time.

The chip crisis and production delays
In 1976, Mostek was heavily occupied with its core business: the DRAM memory chips for which it was the global market leader. Establishing a stable, low-cost production line for a niche product like a chess computer simply failed to gain internal priority as the promised June 1976 release date approached.

The "time-to-market" pitfall
In the 1970s, the tech world moved so fast that a delay of just a few months could be fatal. By the time Mostek and Cardinal attempted to get their hardware and casing ready for production, competitors like Fidelity Electronics were already on the scene, announcing the Chess Challenger.

Salvation through a side door (Applied Concepts)

Cardinal and Mostek realized they could not get the mass production and marketing of such a complex device off the ground on their own. Instead of scrapping the project, they decided to sell or license the entire technology (the F8 hardware layout and David Lindsay's software) to the company Applied Concepts. This explains the final plot twist: while Mostek's "Chess mate" died as a prototype in the factory, the machine's soul was transformed into the BORIS computer, which went on to conquer the world in February 1978. The prototype had not been in vain, then; it was a necessary evolutionary step. It remains a bizarre notion that a concept could change hands so quickly.

It is a fascinating thought that if you bought one of those fancy, talking, handmade walnut-cased BORIS computers in a store in 1978 for a whopping $300, you were essentially getting the perfected version of that bare, exposed circuit board that had been displayed as the "Chess mate" at the New York Toy Fair two years earlier!

The Timeline: David Lindsay vs. Ron Nelson

David Lindsay (1975): Given that the "Chess mate prototype" was on display at the New York Toy Fair in February 1976, Lindsay must have been hard at work on his development kit well into 1975 (and possibly even late 1974) to write his chess code in machine language. He programmed it directly for the brand-new Fairchild F8 architecture (the Mostek 3850 chip).

Ron Nelson (1976): Ron Nelson did not begin work on his very first algorithm until sometime in 1976. He started after becoming fascinated by a primitive chess game on a hobbyist computer. He built his program for a completely different chip (the Intel 8080), which led to the launch of the legendary Fidelity Chess Challenger (1) in March 1977.

Historical Significance
This means that David Lindsay was the true pioneer behind the world's very first commercial, dedicated chess computer. In terms of software development, he was at least nine to twelve months ahead of Ron Nelson (who would later dominate the market with Fidelity)!

Had Mostek Corporation and Cardinal Industries managed their affairs effectively in 1976 and actually commenced factory production in June 1976 (as promised in magazines), then:
1. Mostek/Cardinal would have been the very first manufacturer on the global consumer market.
2. The Chess mate would have achieved legendary status as the definitive "original" chess computer.
3. David Lindsay's name would have become just as legendary in the history of computing as those of Ron Nelson or Peter Jennings.

The Bitter Pill
History is written by the products that actually make it to store shelves. Because Mostek missed the boat due to internal delays (and Lindsay's software didn't hit the shelves until February 1978 via the BORIS computer) Fidelity Electronics (led by Ron Nelson) claimed the glory of capturing the market first in 1977. It is a classic, tragic example of how a superior, earlier prototype in the tech world can still lose out due to a slower time-to-market.

As a result, David Lindsay never achieved the same fame as Ron Nelson, yet in my historical reconstruction, he belongs right at the very beginning! It goes to show that those pioneering years were a race against the clock.

A few related web links

The Mostek mystery:
https://hiarcs.net/forums/viewtopic.php?t=9480&start=15&__cf_chl_tk=FyUaDVDNvq5EMA5.4kXZMKQ6GI33XoU6lKp44qcvDR0-1789330024-1.0.1.1-DeoOHd_Pgnlq2Yb1ESyC5IdDgvhAEpFl8fD3Uj6DVUk

Begining of computer chess - a detailed history (2): **https://talkchess.com/viewtopic.php?t=80681**

Collectors Corner.. Chafitz Chess Computers..The Early Years:
https://hiarcs.net/forums/viewtopic.php?t=1122&start=30&__cf_chl_tk=csmE6A.UVJygTjgbr8B9zJD9D5Q1CJ1kTYSLTEACX6g-1789319217-1.0.1.1-.nBB5gcooL5wnPoceDnR2tFyiF4WUhJ8gzoTIZOELg8

David Lindsay: **https://chessprogramming.org/David_Lindsay**

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