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A History of the ZX Spectrum in 10 Minutes

Prof. Dr. Jan Borchers • Apr 20, 2022 • hci.ac/spectrum





Sir Clive Sinclair
(1940–2021)

Peter Jordan/Alamy

RWTH AACHEN
UNIVERSITY

Small is beautiful

- First pocket calculator (1972)
- Pocket TV (1979)
- eBike (1984)



3

- 1980
- Z80, X for "the mystery ingredient" (Dickinson)
- Introduced
 - the "minimize size and cost through brilliant engineering" concept
 - Tokenized basic
 - screen-flickering tape loading
 - Clones
 - Bad keyboard :)
- Cheapest computer at the time: 100 GBP ready built, 80 GBP in kit form (around 400 GBP/EUR today)
- Just TTL, no custom chips! Only firmware was specific
- Surprising success: 100,000 sold, + clones in US (MicroAce) & Brazil
- membrane keyboard, 3 parts instead of hundreds (Dickinson)
- 1k RAM, 4k ROM
- 1k shared with screen. Full screen -> 384 bytes for program!
- 16k RAM Pack via Expansion Port
- No sound, B&W TV
- CPU does rendering, so flickers during input or computations
- BASIC, commands on keys easy to learn (and tokens save memory)
- Tape: Screen stripes while loading (useful artifact)

2:20

The above info is mostly from Wikipedia.

Designer Rick Dickinson says they named the ZX80, after its processor, the Zilog Z80, with an added X for "the mystery ingredient". (<https://www.bbc.com/news/magazine-12703674>)



1981, a year later, my first computer

Introduced

- ULA: 21>4 chips (CPU, RAM, ROM, ULA): Clock, screen, audio I/O, kbd,... (like FPGA)
- On-the-fly syntax check before running
- 3rd party HW+SW scene, indie games
- ZX Printer

Only few changes:

- ULA: 21>4 chips (CPU, RAM, ROM, ULA): Clock, screen, audio I/O, kbd,... (like FPGA)
- Slow Mode removed flicker
- Floating Point BASIC in larger ROM
- On-the-fly syntax check before running
- 3rd party HW+SW scene, indie games

16k RAM Pack (Wobble), ZX Printer

- Manual by Steve Vickers (British humour removed in Timex US version, <https://en.wikipedia.org/wiki/ZX81#Reception>)

Even cheaper than ZX80: 50 GBP kit (200 GBP/240€ today), 70 GBP assembled

- Expanded target customers from hobbyists to the general public [Wikipedia]
- VIC-20 3x, Apple II 10x more expensive

- >1.5 million units sold (more than VIC-20)
- Design award
- Made Sinclair Research one of Britain's leading computer manufacturers
- Almost became the BBC computer
- A dozen clones (Timex, Brazil, Argentina, China, S Korea)
- 3rd party HW+SW: Tens of thousands, mostly youths, came to first ZX Microfair in 1982. Psion Flight Simulation & VU-File DB program.

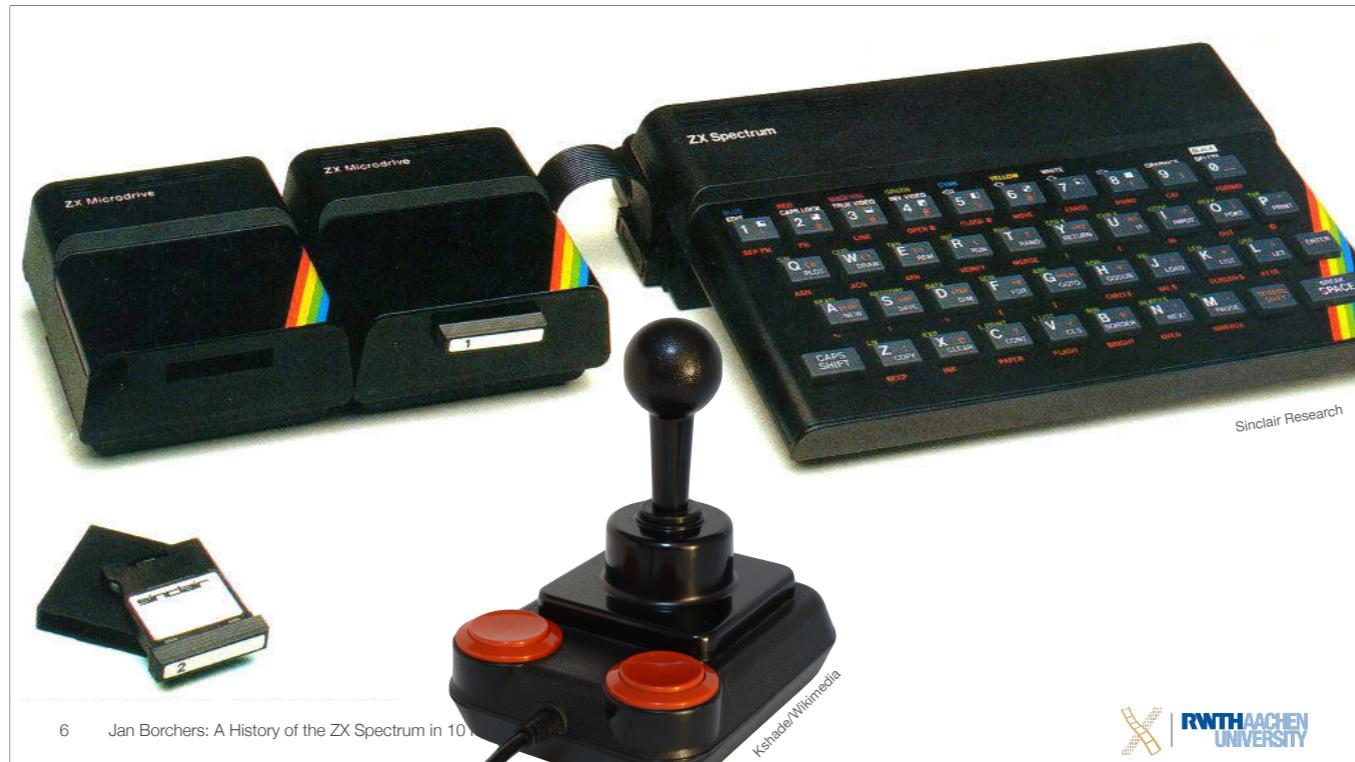
Sir Clive Sinclair himself told the Guardian in 2011: "Our machines were lean and efficient. The sad thing is that today's computers totally abuse their memory - totally wasteful, you have to wait for the damn things to boot up, just appalling designs. Absolute mess! So dreadful it's heartbreaking." (<https://www.bbc.com/news/magazine-12703674>, 2011)

HD interface: "quite overgilding the lily" [<https://en.wikipedia.org/wiki/ZX81#Hayman>]

Photo: Evan-Amos, CC BY-SA 3.0



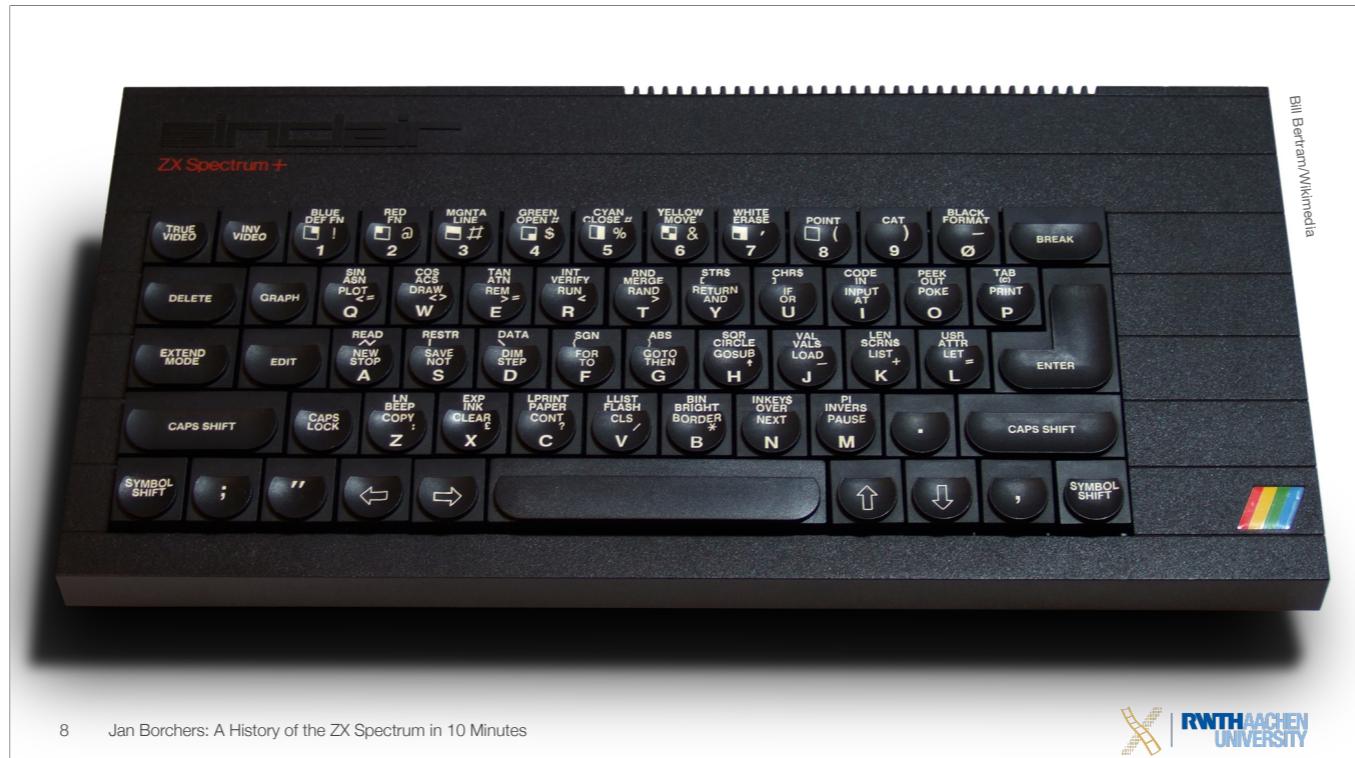
- Released 23 April 1982, 16k 125 GBP (470 GBP = 560 € today)
- C64 not available yet (shipped in Aug), but also 3x more expensive (\$595 = today 1400 GBP/1700 €)
- My 2nd computer
- New: Color, Sound, 16/48k RAM, 16K ROM
- Attribute Clash
- Simple on/off beeper sound
- Sold 5 million units, not counting clones
- (Show how small it is)



- 1983: Microdrive, ~85KB in 8 seconds, only 49 GBP (= 175 GBP = 210 € today)
- Needed an IF1 (30 GBP)
- ZXNet local networking (64 computers) and standard RS232 serial port



- January 1984 (12 days before the Mac)
- Introduced:
 - Decent keyboard
- Sinclair's business computer after the Spectrum
- Motorola 68k 32-bit CPU, but only 8-bit data bus
- Dual microdrives, preemptive multitasking OS (inspired Linus Torvalds' Linux)
- Only 150,000 sold



- Spectrum +, October 1984, Codename “TB”
- Same PCB, better keyboard (from QL), aimed at C64
- Reset switch
- Xmas 84: UK 14% households computers, more than any other country

"Another lucky break was the codename we chose for the Spectrum+ project. The chief designer of the machine was a Ford Thunderbird fanatic - so the in-house codename was 'TB'. Of course, if you were discussing the project and an outsider started listening in, it was easy enough to turn the conversation into one on TV!" — Nigel Searle, Sinclair Research, Your Spectrum Issue 10, December 1984 - Circe, http://www.users.globalnet.co.uk/~jg27paw4/yr10/yr10_a4.htm



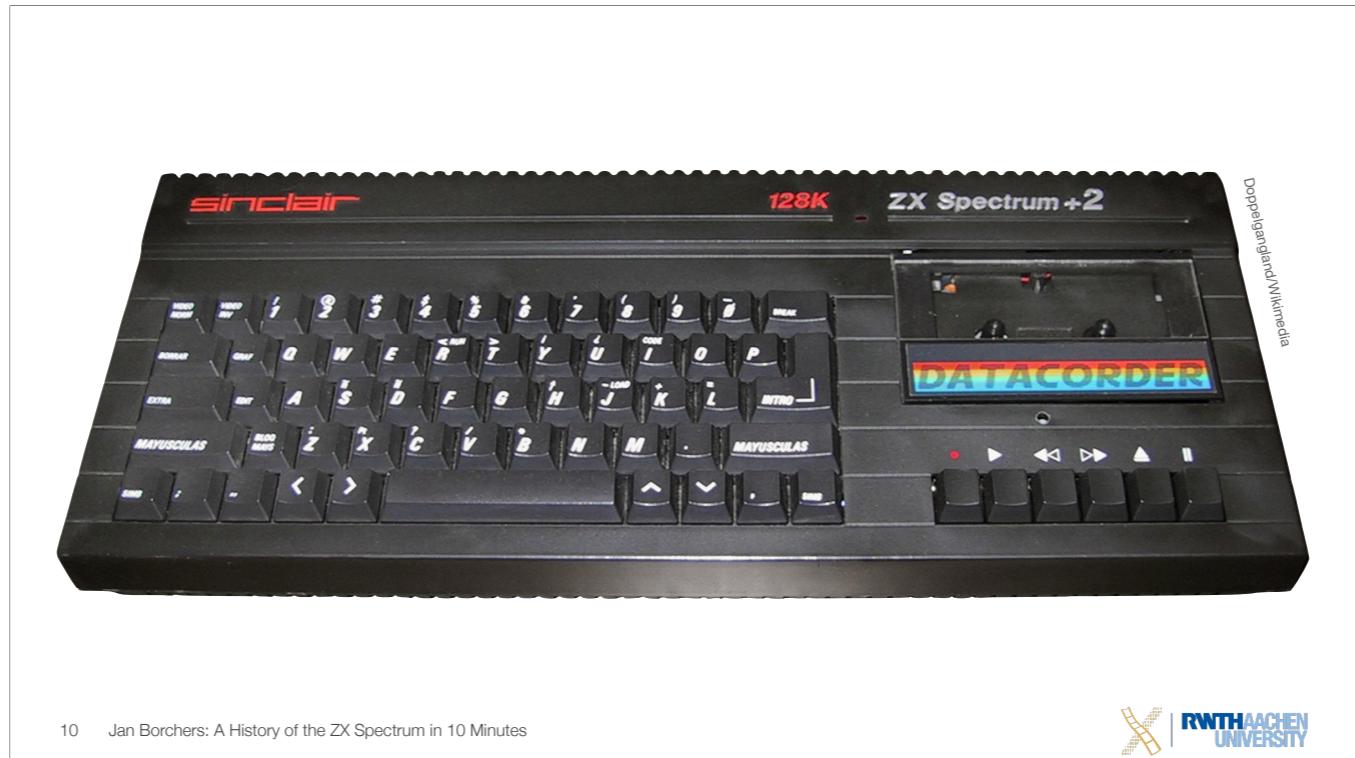
1985 Heatsink (“Toastrack”)

Collaboration with Spanish distributor Investrónica (avoid tax for <= 64kb)

Introduced:

- 128k with Bank switching
- 3-channel sound (AY-8912, like CPC)
- MIDI out
- RS232 (like IF1)
- RGB out
- Alternative to token BASIC input

This year, the Atari ST came out for \$800 with monitor (also Amiga, though >\$1000) ⇒ 16 bit home computer era started



+2: 1986 after Amstrad bought Sinclair IP

- Looked like (Schneider) CPC, built-in tape recorder
- Better keyboard, but without tokens on it, otherwise a 128k

+2A: 1987

- Black, Shared PCB with +3
- Rare audio bug on early models [Centre for Computing History]

+3: 1987

- Added Amstrad's 3" floppy drive, could run CP/M (canceled 1990 not to compete with new CPC)
- New ROM structure brought many incompatibilities (e.g., no Microdrive, no Arkanoid)

+2B / +3B: 1988

- New, dedicated motherboards [https://sinclair.wiki.zxnet.co.uk/wiki/ZX_Spectrum_%2B2A/2B,_%2B3/3B#.2B2B_and_.2B3B]
- Manufactured until 1993



What happened next? * Clones * over 100 different models!

- esp. USSR & S America, in 80s+90s (more units than C64?)
- Harlequin
- FPGA starting in 2000s



Latest clone: Spectrum Next (2020, Trucco+Belavenuto), Rick Dickinson design

Spectrum Impact:

- 10,000+ games, 100+ new games last year, keep pushing
- Great BASIC manual, and learning Z80 Assembler is fun (cf. PICO-8)
- My first computer paintings, digitized photos, 3d models, computer music
- Also gave non programmers an early start in digital age
- Sinclair made sure I started with elegantly designed computers
- Due to simple tech (no sprite engine/SID), a blank canvas for creativity

Rendering: Rick Dickinson on flickr (<https://www.flickr.com/photos/9574086@N02/36692386893/sizes/3k/>)

Bonus Topics

- Spectrum idiosyncrasies (Attribute Clash,...)
- Latency
- Resources: Alessandro Grussu: **SPECTRUMPEDIA** book, 2nd ed. (2022)
- Gaming: Our Sinclair Podcast & Discord
- Communities: SpectrumComputing, TLienhard, BASIC/Z80/Next/... FB groups
- Z80: Assembler Video Tutorial Series, “How to Write ZX Spectrum Games” (Jonathan Cauldwell)
- ZX Spectrum Next & clones (N-GO,...)