From FORTRAN to Fireworkz

One programmer's voyage through the 1980s and 1990s

Stuart Swales
Formerly of Acornsoft
and Colton Software
September 2020

Sparking an interest

- I first became interested in computer systems through electronics as a teenager
- Various electronics magazines sampled
- In 1976 I stumbled upon "*Electronics Today International (ETI)*"
- Subscribed to *ETI* for many years

ETI System 68

- A modular Eurocard-based system
- Supported several microprocessors, with board designs for the Motorola 6800 and SC/MP
- Designed principally by John Miller-Kirkpatrick
- Articles ran from April 1977
- Sadly I had insufficient cash!
- "*The annotated listing of the monitor PROM is available on request*". Hmm...
- 20p well spent — my first exposure to software!

Still interesting, though

- Motorola M6800 Microcomputer System Design Data guide

  A snip at £2.00 from NewBear Computing Store at the NEC

BASIC at 300 baud

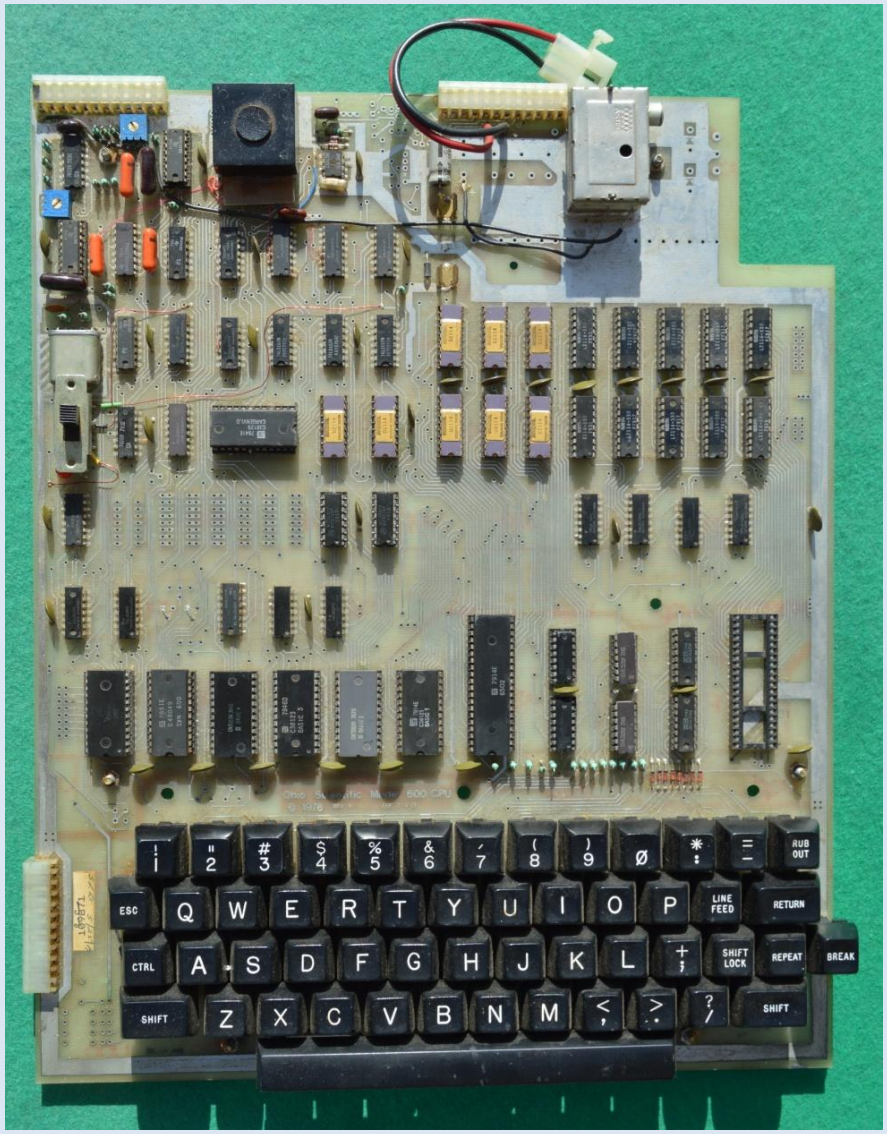
- My maths teacher at school began an Open University course that year which involved some ‘online’ computing
- We had an ASR-33 teletype (with punched paper tape of course) and a phone coupler
- The Open University system was a Hewlett Packard (System 10?) located in Newcastle
- The HP had a BASIC interpreter, and that was well documented in a HP manual supplied with the course material
- School were happy for me to use it at lunchtime

Increased potential

- In 1978 I'd taken on a part-time job at Tesco (*other supermarkets are available*) stacking shelves
- Cash was accumulating quite quickly
- Could I buy a system now? Er, no.
- Commodore PETs and Apple IIs had come on the scene but everything still seemed way out of my league

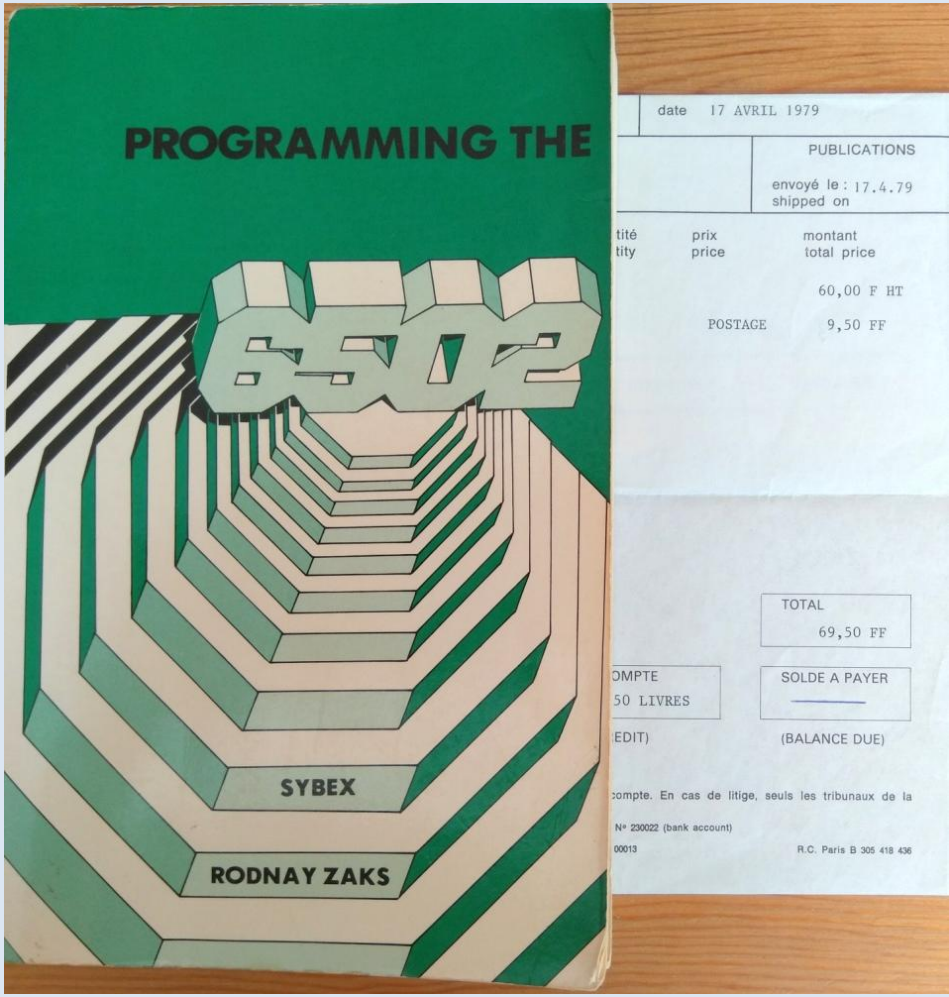
Ohio Scientific Superboard II

- And one day in early 1979 I spied an advert for this system...
- 1 MHz 6502
- 4 KB SRAM
- Decent keyboard
- Cassette interface
- BASIC ROMs
- Keep saving!!!



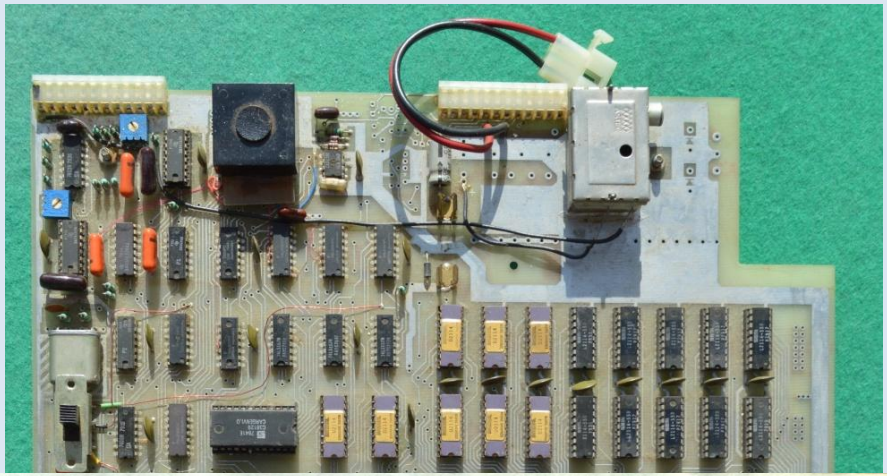
Programming the 6502: Rodnay Zaks

- All those 6502 systems looked good, so I thought I'd better get prepared for the day when enough £s had accumulated!
- ISTR another 6502-based micro system in a mag had just published its EPROM content but just as a hex dump and of course that needed investigating...
- So...send money to Sybex



Ohio Scientific Superboard II

- Then the day came when I thought I had enough £s so went for a demo
- Who could want more?
- Me, obviously, as I spent the extra £40 to max out the SRAM to 8 KB!
- That's only £10 per kilobyte, folks...



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Programming the 6502: Stuart Swales

- Naturally, the first program one writes is a disassembler out of curiosity
- Somewhere I still have my Superboard II monitor ROM annotated listing neatly typed out – I know that it's in this house in a red folder!
- I think that I got a payment from the OSI UK service agent for a copy of this listing and that of the loadable extended monitor code

Programming the 6502: Stuart Swales

- The Superboard II had character-based graphics, with some useful ‘graphics’ that included a ‘tank’ in eight orientations and a two-character composite ‘Starship Enterprise’
- I wrote a few games for my amusement, including the mandatory lunar lander
- I did sell a few copies of the games and disassembler on cassette tape, advertising in *Computing Today* (an *ETI* offshoot)

Cambridge

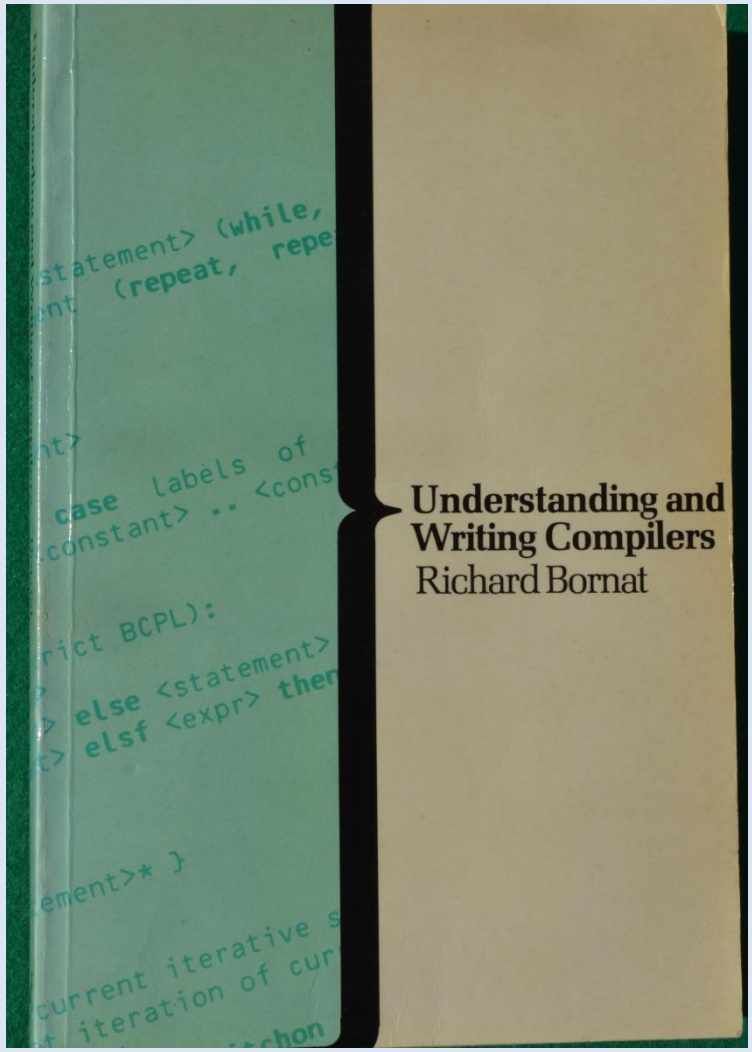
- I went to Cambridge to study Natural Sciences (Physics, really) in 1981
- IBM System/370 Model 165 – Phoenix OS
- This is where I got to write FORTRAN code for the first time and play with plotters
- Great to discover the huge range of useful routines available in the NAG library
- You could even have a whole one megabyte process limit if you asked nicely

PRIORITY EXCEEDS 255 - PLEASE LOGOFF

- A useful side-effect of joining the C.U. Physics Society was that you got extra resource allocation on the IBM
- However, you could still easily run out...
- Discovered quite early on that even if your remaining resources were too low to allow you to log on interactively using a terminal, if a job was submitted via the punched card reader, it would always run it

Who is this person?

- A friend from college, Tony Thompson, who was doing Computer Science, had borrowed my compiler book
- Tony's Computer Science supervisor, Jeremy Bennett (from Acornsoft Languages) spots an unfamiliar book on Tony's shelf and leafs through it
- There is an unfamiliar name in the front cover...
- Who is this person?
- Why don't I know him?



Just the ticket!

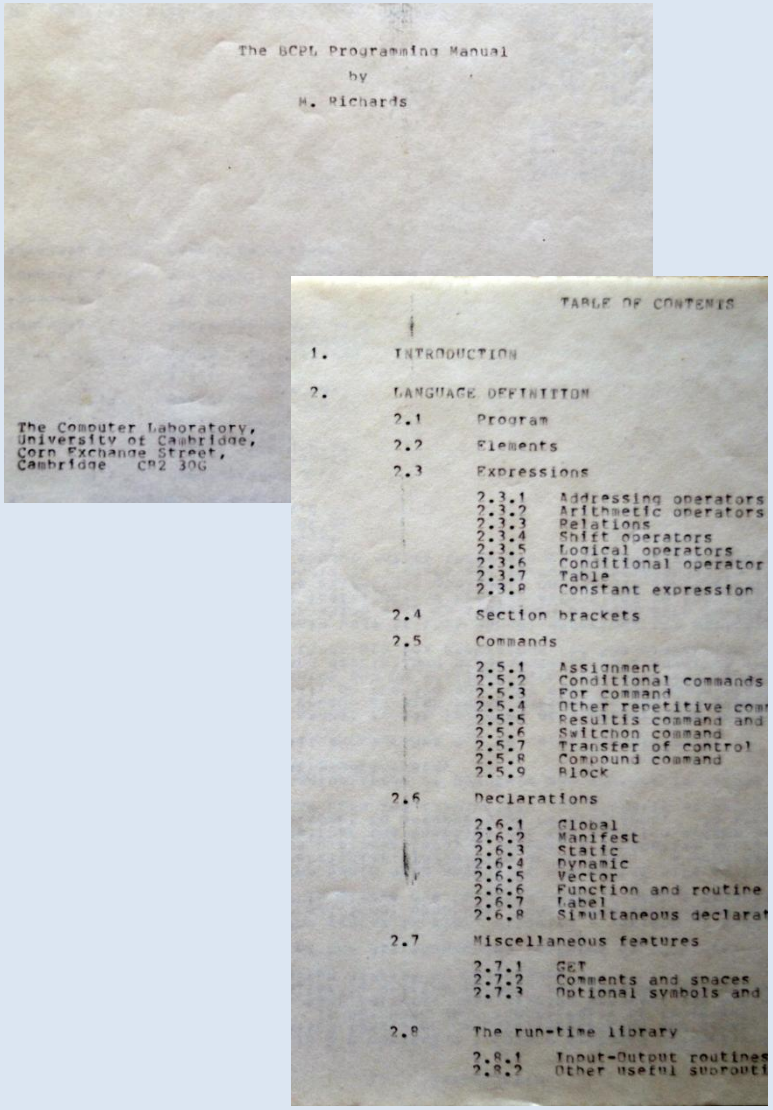
- In the summer of 1983, between the second and third years, I was down in Cambridge doing the ‘Long Vac’ summer labs at the Cavendish Laboratory
- Tony gets me to meet Jeremy Bennett
- Acornsoft have a FORTRAN IV (66) compiler written in BCPL that they’d like to target the BBC Micro
- FORTRAN? Tick
- BCPL? Tick
- 6502 assembler? Tick
- Great stuff — when can you start?
- Introduce yourself to DJ-D and see you then!

FORTRAN – I was a BCPL compiler

- Acornsoft Languages were then in the process of publishing the two-ROM BCPL system for the BBC Micro
- I think the FORTRAN compiler was too large for this BCPL system to process
- My job was to translate the FORTRAN compiler from BCPL directly to 6502 assembler
- There was a new macro assembler for me to use: MASM, written by Jon Thackray at Acorn

BCPL – what's that?

- BCPL ('Basic Combined Programming Language') originated in Cambridge and is a forerunner of the C language
- Aside: an article in *Acorn User* once helpfully expanded the term BCPL as 'Byte Protocol Control Language'



The BCPL Programming Manual

by

M. Richards

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Corn Exchange Street,
Cambridge CB2 3QG

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Back to FORTRAN

- Acornsoft's overspill office — where I was to work for the rest of the summer break — was in Green Street, Cambridge, and not too far from Market Hill
- A few weeks in, and just as I'd begun to make good headway with the FORTRAN project, Jeremy Bennett announced that he's off to do a PhD:

  "*A methodology for automated design of computer instruction sets*"

  He later became a Lecturer in Computing at the University of Bath, authoring the textbook "*Introduction to Compiling Techniques*"

Enter PMF

- That was when Paul Fellows arrived on the scene to become the Acornsoft Languages Group Leader
- Paul had written tons of software published by Acornsoft for the BBC Micro, including Sphinx Adventure and the S-Pascal compiler

Fun with 6502 Second Processors

- At this point we only had one 6502 second processor at Green St. I needed to use one for MASM, and there was someone else working on a large LISP system
- Sharing a second processor isn’t fun
- So I paid a visit to the stores at Acorn Fulbourn Road armed with the parts list for a 6502 second processor
- The very helpful chap showed me the system in stores and left me to the task of grabbing all the bits needed and signing them out
- Soldered it all up and was happy
- Apparently someone from Acorn rang Acornsoft a few months later asking for ‘Mr Swills’ as they weren't happy – employee not found in system!

Progress with FORTRAN

- I'd made a decent stab at getting this going in the time available, so Acornsoft were happy to lend me a system to continue working on it in my spare time during my third year at Uni
- For some reason I can't remember, I ended up with TWO BBC Micros (one with Tube) in my room, much to the delight of friends who would call round to play games

Gainful employment?

- I joined Acornsoft full-time in September 1984 in the Languages Group, working for Paul Fellows once more
- Paul had already recruited another programmer to the group, Richard Manby
- Tony Thompson joined as well!
- We'd work together as a group for almost four years

Betjeman House

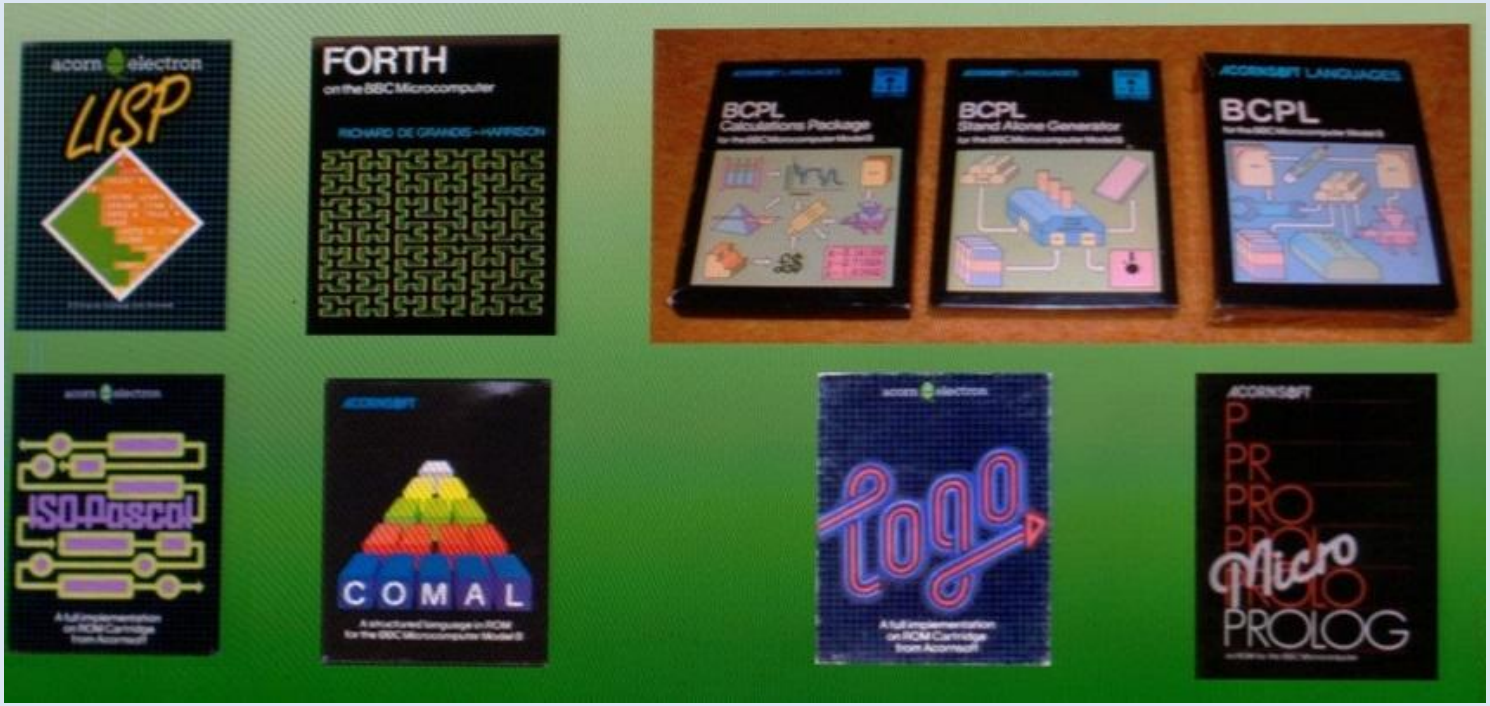
- Acornsoft had recently coalesced back under one roof, on the top floor of Betjeman House, at the top of Station Road. Nice spacious offices. Luxury indeed
- Acornsoft Languages had the office in the furthest corner, and overlooking the Botanic Gardens
- There were often squirrels in the trees to distract you
- Luckily I'd rented a flat only ten minutes walk away and could cut through the Botanic Gardens
- If I was early, the main exit gates wouldn't be open
- No problem, you could just nip through the bushes and jump down a small wall, surprising the people working in Logica on the ground floor

FORTRAN

- I was still developing FORTRAN, finishing the compiler then onto the run-time system
- Tony Thompson did the floating point support code and the linker/loader
- We did seem to get less time to work on this as the months passed though
- I think this drew to a halt when we realised that it was always going to need a 6502 second processor to compile anything useful, and the market wasn't there
- Also, as far as I remember, we hadn’t started any user documentation either!

More languages

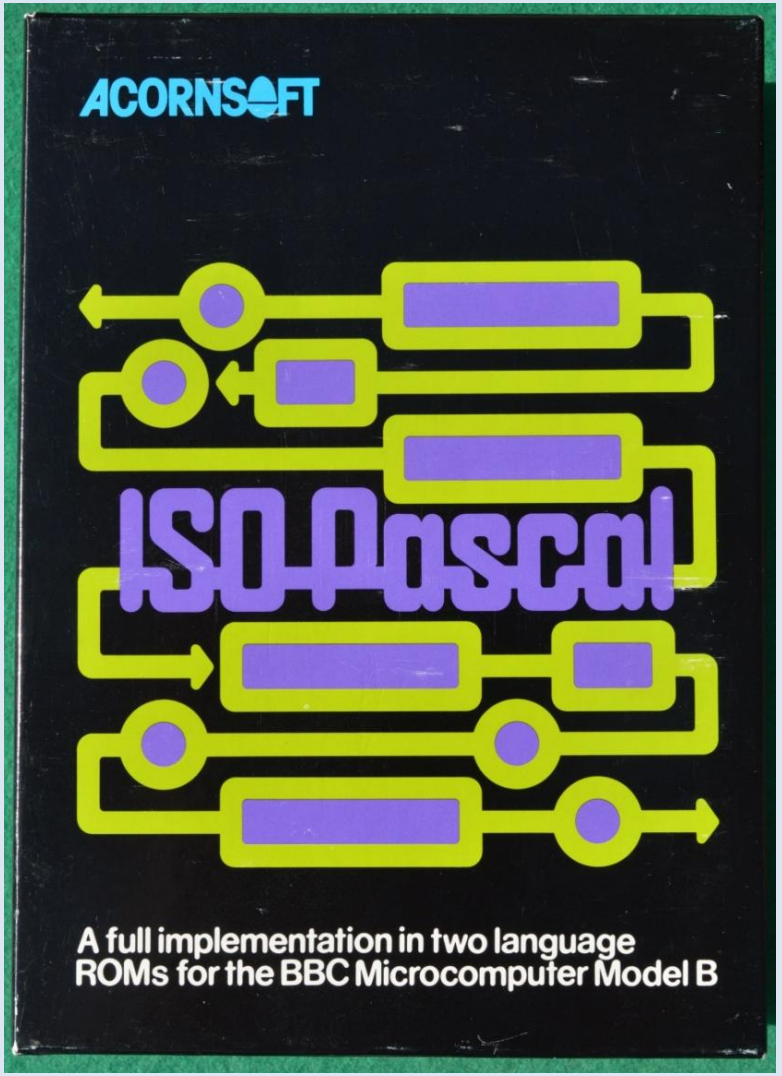
- Acornsoft continued to publish language products thick and fast, several externally written such as COMAL and Micro Prolog



Credit: Paul Fellows

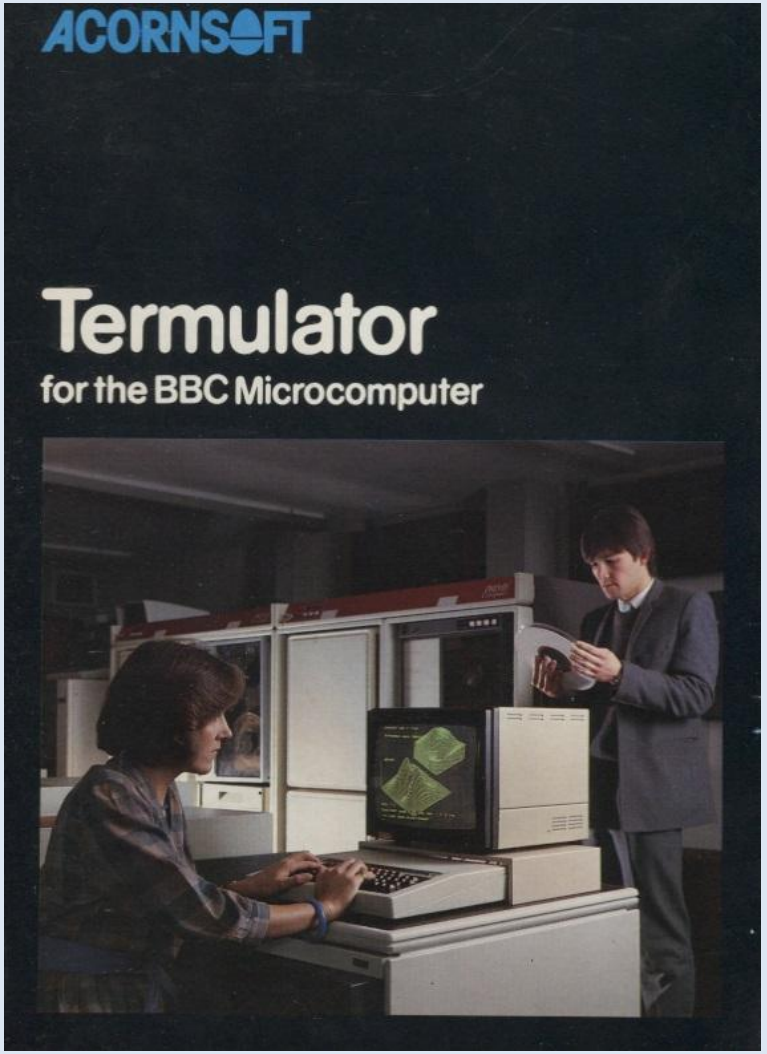
ISO-Pascal

- ISO-Pascal was written in-house at Acorn by Ben and Li and published by Acornsoft in 1984
- Full implementation
- BSI certified
- Compiled to interpreted BL-code



Termulator

- Or, don't believe a word they say
- I had done a simple text demo for the front photo on this pack
- *"Can you make it more interesting?"*
- Yes, but... you can see its now 40 characters not 80
- *"Oh, you won't see that on the finished product..."*



Credit: Centre for Computing History

Master testing – to destruction?

- Acornsoft Languages managed to obtain an early prototype board of the Master (internally called Project B at that point) for compatibility testing on condition that we hid it well
- As well as putting it in the furthest corner of our room, in the furthest corner at Betjeman House, it was screened off behind some partitions
- We also thought it would be a good idea to disguise it by putting it in a BBC Model B case
- That's when we discovered that the prototype board didn't fit
- Out comes the hacksaw, cutting enough of the back of the case off
- We didn't have anything to hand that'd cut across the base plastic, so that's when I started to kick the back plastic out having cut it some more to weaken it
- And of course that was when DJ-D wandered in...

Doom and gloom

- Come back from holidaying in the Lake District in February 1985 and the world seemed to have collapsed!
- *'Cuts across the board'*
  Yes, even for profit-making divisions like Acornsoft
- Some of us still remember subsequent months as a time when were making quite a lot of money for Acornsoft selling site licences, burning lots of EPROMs of things like Micro Prolog
- I once took a phone call from a guy in South Africa wanting to buy Microtext licences. A quick query with PMF and we'd sold him a country-wide licence for a good sum

ISO-Pascal for the 65816

- It seemed a good idea to port this excellent system to the then-new 65816 processor
- This would allow applications for the forthcoming Acorn Communicator to be written in Pascal

Credit: Chris's Acorns

ISO-Pascal for the 65816

- The 65816 can use 16-bit wide registers and supports more than 64KB of memory, although care is needed near 64KB bank boundaries
- Was amused to see the phrase
  '*This is a defined no-no*'
  in the processor data sheet
- I began porting the BL-code interpreter and its run-time support code sometime in early 1985
- This was my first encounter with the Turbo Tube with 256KB, needed to run the TurMasm816 assembler
- The Communicator MOS isn't the BBC MOS.
  It uses the COP instruction for OS calls (SWI anyone?);
  none of this JSR osbyte, matey
- I think that this ISO-Pascal port was complete but was never released; we did have serious discussions about using it to reboot the Communicator project

Acornsoft MegaROM

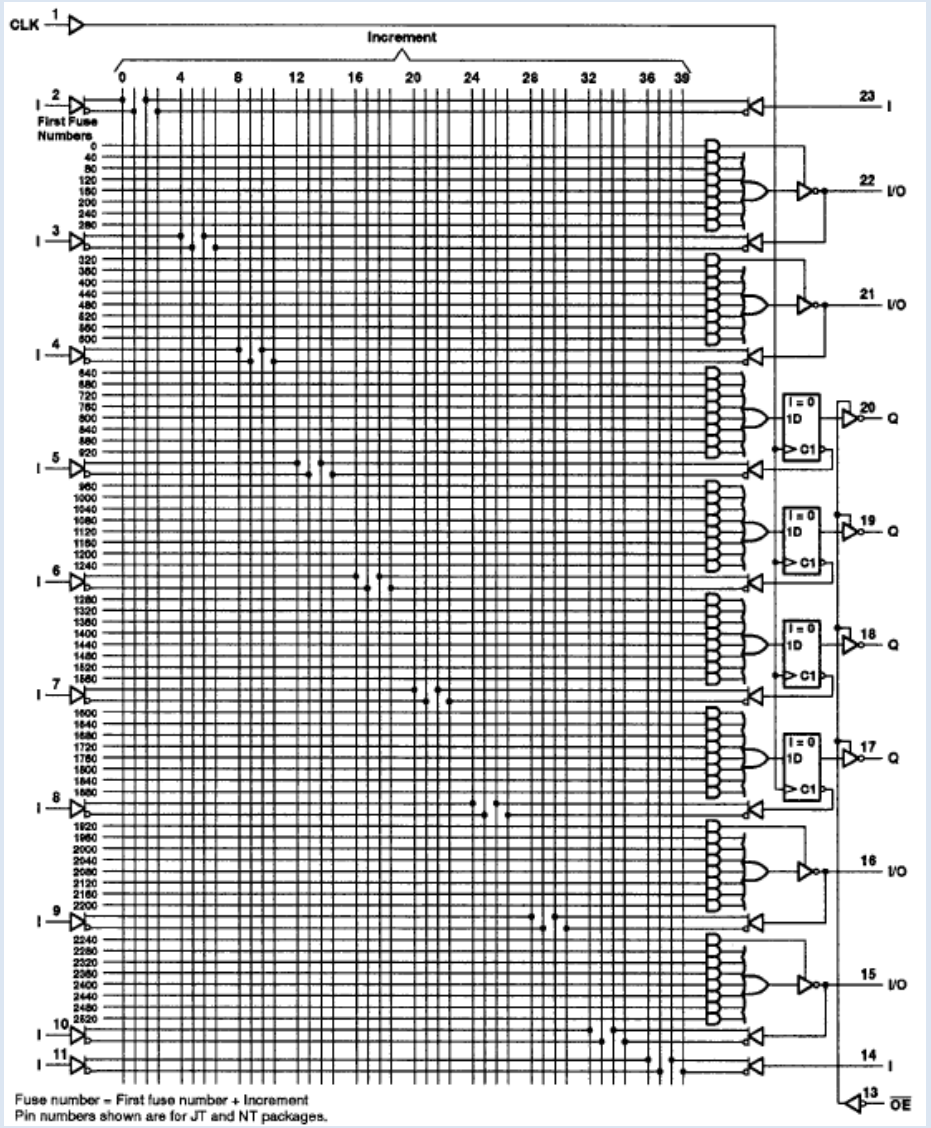
- *Not to be confused with the 'MegaROM' (i.e. megabit ROM) found in the Master*
- By this point Acornsoft had produced a number of two ROM language systems, e.g. BCPL, Logo, ISO-Pascal
- But an unexpanded BBC Model B only had four ROM slots, with BASIC usually occupying one, and DFS or NFS another
- Wouldn't it be nice if these products could be made to fit in just one ROM slot?

Acornsoft MegaROM

- We came up with the idea of a hybrid device with a standard sideways ROM footprint containing a larger-than-16KB ROM and a control logic device
- The latter would have a read-sensitive area at the end of sideways ROM space (at &C000-(4*n)) that latched the low two bits of the address bus to present as the high two bits to the larger-than-16KB ROM

Acornsoft MegaROM

- *'Some engineers programmed PAL devices by manually editing files containing the binary fuse pattern data'*
- That would be us — fuse map drawn on a piece of paper (that's a PAL20R4 there); X marks the spot
- Surprisingly had no problem at all getting PAL samples from MMI



Acornsoft MegaROM

- Just as the MOS passed service calls around the sideways ROMs, we needed to also — and transparently to the MOS — pass these calls to each of the sub-ROMs in that physical slot in turn
- We could patch the service entry in the each sub-ROM's header to reference the sub-ROM switching code
- Most ROMs could be patched without needing to be recompiled / reassembled
- Given that the sub-ROM switching code was executed in the ROM, it had to be in the same location in each sub-ROM — usually just before the read-sensitive area below &C000 — so that when the sub-ROM changed, the 6502 could still execute the instruction that it already in the pipeline

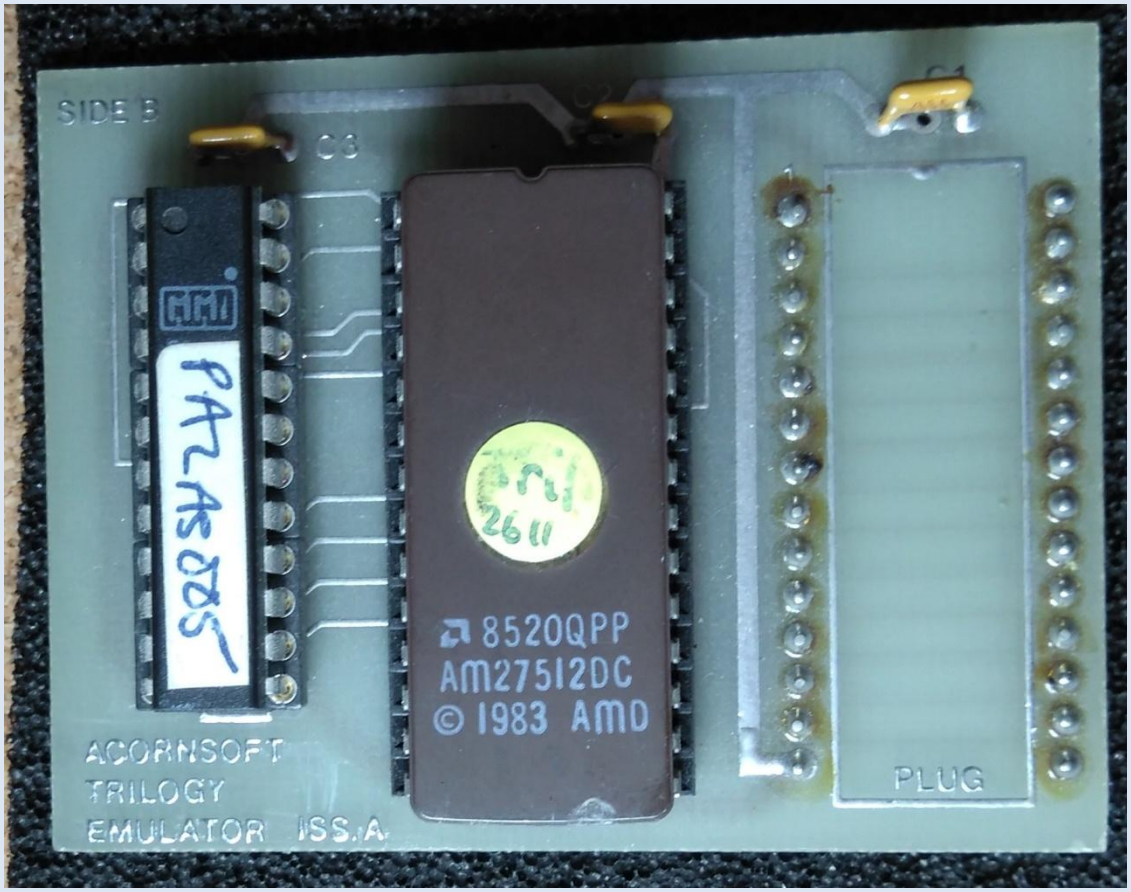
Acornsoft MegaROM

- We designed a butterfly board containing two 27128 EPROMs and a PAL to demonstrate this concept
- Pretty sure that we made it work for all our language ROM pairs
- Paul Fellows thinks that some of the two sub-ROM hybrid devices went into production; I certainly remember talking to production engineering at AB

Acornsoft Trilogy

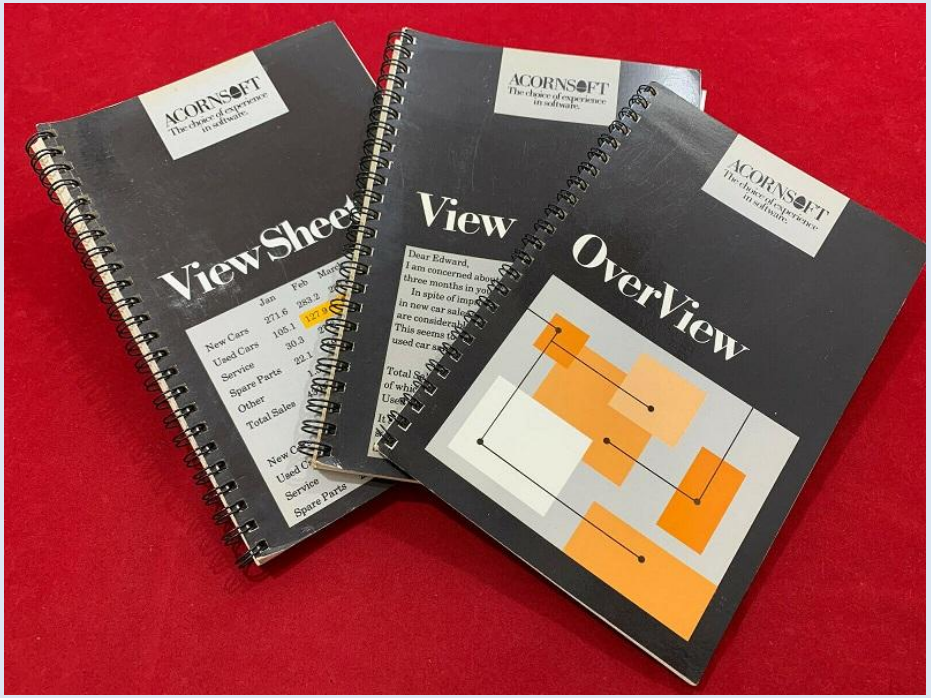
- VIEW, ViewSheet, ViewStore and ViewSpell

  Four sideways ROMs in one 27512 device



Acornsoft Trilogy

- I suspect that we were looking at doing this to sell as a one-chip product for B / B+ users to complement Overview which was aimed at Master users



Overview contained every product in the View family except for the standard VIEW and ViewSheet images, which were in the Master ROM

Credit: CJE/4D

Acornsoft Trilogy

- It would be nice to see exactly how that all worked again, especially the sub-ROM switching code
- The kind folk at the Centre for Computing History have volunteered to dump the EPROM and see if they can read the PAL fuse map
- Watch this space!

Newmarket Road

- Acornsoft moved out of Betjeman House over to the Newmarket Road site sometime mid 1985
- Some (i.e. not very much) space had been cleared for us upstairs, so we had to go vertical – it was orange crate high-rise city for some time
- There were a lot of heavy filing cabinets moved over too. Facilities manager appears waving arms excitedly: "*You can't bring those up here!*"
- Floor loading, you know. Careful positioning required adjacent to support pillars...

Master Turbo

- A revamped 6502 second processor specifically for the Master
- Fits internally
- Used a CMOS 65C102 @ 4MHz, with really helpful new instructions (BRA, DEA, INA, PHX, PLX, PHY, PLY, STZ) and an indirect addressing mode without an index register
- I updated the Tube OS
  - Some bug fixes
  - Extended the range of OSWORDs handled to match the Master MOS updates e.g. for TIME$

Credit: CJE/4D

A Top Tip from Tutu

- When I checked out the old Tube OS source from the Drawing Office, it was in an obsolete assembler format – and I think it required a System 3 to build on

  Top tip: Keep reference build systems!

- As it happened, I had already reverse-engineered the Tube OS and my liberally-commented MASM source files assembled to the same binary —so we used that. A comment in the new source innocently reads: '*Converted from UADE format to MASM format*'

Acorn shows

- I remember being put up at a pretty plush hotel the first time, near Tower Bridge
- Second time was in a somewhat less plush joint out past Ealing Broadway
- By 1986 Acornsoft weren't even being invited to attend shows

Olympia 1986

- Acorn's stand at this show was utterly dominated by their ambitions in the scientific workstation and business markets
- Acorn Cambridge Workstations (£5k+) and Tapestore were occupying most it with Communicator down the other end
- I don't quite know how we wangled it, but Paul Fellows and I grudgingly got a corner of the stand to show off the BBC B+128 that had recently been launched (shortly before the Master)

Jumper or Hair?

- The crowds thronged around our corner
- People were wandering up to besuited gents and ladies on the stand asking “*Where's this new BBC Micro?*”

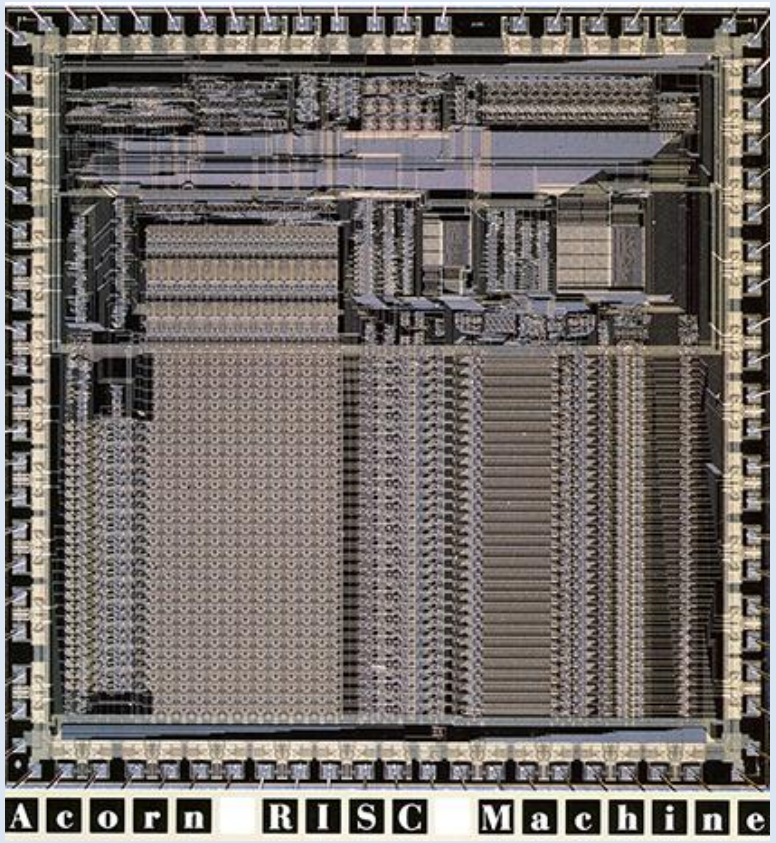
Jumper or Hair?

- The crowds thronged around our corner
- People were wandering up to besuited gents and ladies on the stand asking "*Where's this new BBC Micro?*"
- Apparently you needed to talk to "*him with the jumper*" (Paul) or "*him with the hair*" (Stuart)

And that's not even peak hair!

Well done, Acorn

- At this show, there was an ARM1 chip unobtrusively mounted on the wall of the stand quietly announcing its arrival
- One very satisfying moment was when someone sidled up to me, pointed at the ARM, and said:
- "*Well done, you beat us to it*"
- Pardon?
- "*I work for HP. You've got your RISC chip on silicon before our team*"
- They had got their new PA-RISC architecture working at that point, but only in discrete TTL



Credit: Acorn

Mostly ARM-less

- Acornsoft were not high – if at all – on the list for ARM kit
- Having ‘previous’ for building a second processor in the past, I volunteered to build four ARM second processor systems
- The deal was that Acornsoft would keep one and the others go to needy folk at Fulbourn Road
- Everyone was happy and we didn’t have to run ARMulator any more

Credit: Peter Howkins

ISO-Pascal for the ARM

- Why not, indeed?
- The objective here was for the compiler to produce ARM code to run natively rather than BL-code as before
- As we needed to modify the compiler quite a bit to do this, its long compilation time – which was still on a BBC Micro with 6502 second processor – would be a hindrance
- Fortunately Richard Manby had been working at home on a Pascal compiler for his homebrew Motorola 68000 system and had a really fast parser which we could use as a quick syntax checker before starting a compile job
- Sadly another unfinished product
- We did get the ARM code generator working but it was sub-optimal and events overtook us!

End of a era: Acornsoft C

- I think that the last native 6502 application software I worked on would have been the Acornsoft C system (from David Christensen *et al*.) in 1986 with Paul Hudson
- Yup, there are ‘TutuPaul’ padding words in there!
- X/Open Portability Guide was used for library
- Probably did the integration with Edit as well
- I am pleasantly surprised to see that it was actually produced as I don't remember seeing it as a finished product

Project Arthur

- Your team isn't busy at the moment – can you write us an operating system for the ARM systems that we're building?
  You've got five months.
- Sure...

A500 Second Processor

Sadly now depopulated – boo hoo!

Credit: Chris's Acorns

A500 Second Processor

- This was an ARM1 second processor running Brazil, but with the three other chips present: MEMC, VIDC and IOC
- Brazil had been modified already to initialise MEMC to present a contiguous block of memory upwards from zero
- As a second processor, this still sent all the useful SWI OS_Byte / OS_GBPB etc over the Tube to be executed by the host BBC Micro so useful tools like AAsm and Twin worked OK
- Unlike the ADS, which had a single byte-wide ROM that the hardware accessed four times to read a word, the A500 second processor had four ROMs so words could be read at full speed
- Annoyingly these four ROM sockets were close enough together that you couldn't use Greenwich ROM emulators – I spent an awful lot of time programming new EPROM sets for the A500 second processor

Arthur development

- Paul Fellows has covered this well in his presentations, some are quite recent – I would commend them to you, as I'll try not to repeat too much here
- We started off as the old Acornsoft Languages team, Tony Thompson, Richard Manby and myself, headed by Paul, who did his utmost to keep manglement at bay
- We were soon joined by Tim Dobson from Acornsoft Games; Nick Reeves (ADFS) and Brian Cockburn (ANFS) coming over from Fulbourn Rd

Relocatable Modules

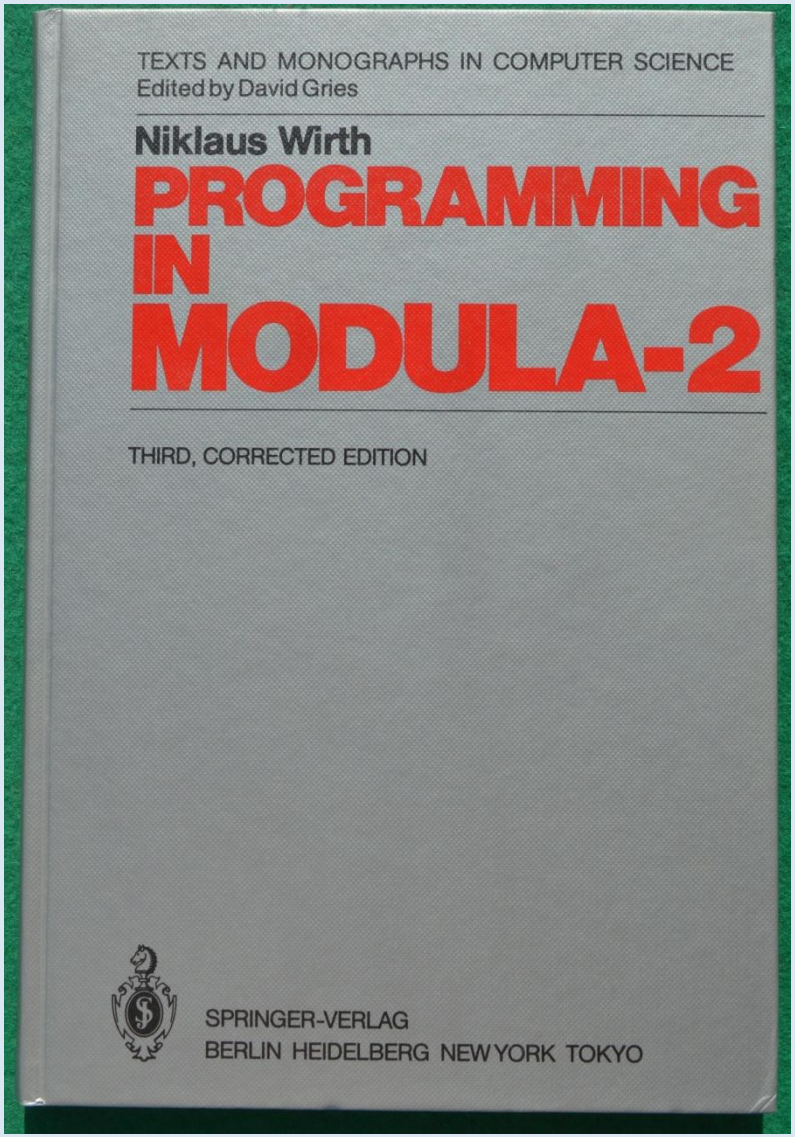
- A bit like BBC Micro sideways ROMs
- Needed a module header, which had service entry, etc...
- To help with consistent *command processing, modules could expose a table of commands
- Like sideways ROMs, unknown OS_Bytes etc. could be passed around loaded modules

Relocatable Modules

- We wanted these to be position independent code (trivial on ARM), with no relocation tables needed
- Could go into the ROM too
- No compiler that we had at present (m2), or could see being developed, could produce these, so it was assembler all the way
- ARM assembler is good
- Me like!

Mind your language!

- Some of the manglement insisted that we were using Acorn Modula-2+ Extended Enhanced or whatever it was called to write the OS
- To this end, we had all been given copies of Wirth's book '*Programming in Modula-2*'
- I got as far as putting my name in the front



SWI OS_Heap

- My first SWI! In fact the first SWI added in Arthur
- Well, having decided on relocatable modules, we needed somewhere distinct to put them!
- So we created a module area
- Wouldn’t it be nice if there was a memory allocator to use?
- Not just for this purpose, but it could run the system area too
- And usable by other modules, or even the user, for their own purposes
- Enter SWI OS_Heap... and so it begins

SWI power

- Wrote many of the *commands in the UtilityModule
- All these used SWIs, no internal shortcuts, which exercised the SWI interfaces
- This was to be the aim for all the *commands in all modules

Enter the A500

Credit: Chris's Acorns

A500

- As you see, it’s grown a wee bit!
- This now has onboard floppy drive controller, hard drive (ST506) controller, Econet and sound
- Note that the onboard Tube interface has disappeared. Thankfully a Tube podule could be fitted to the backplane so that it could still communicate with the host as the umbilical was not ready for cutting just yet!

Facepalm moment of 1987

- One day Hermann was showing a visitor around our area, pointed into one of the A500s and uttered the unforgettable phrase:

  '*Look, it's just four chips*'

A little knowledge is a dangerous thing

- Another, later, visitor was a junior Education minister of the day, and on being shown the A500 (minus case)
- '*How much memory?*'
  Four megabytes
  '*That's not very much!*'
- '*Oh, here's a toroidal transformer*'
  – pointing at the fan

FileSwitch

- Wanted to have a system where all the filing systems could be active at once
- Still had to have the usual *ADFS / *NET and *DIR / *LIB etc. to support BBC programs
- Also wanted to have filing system *commands like *Dump work the same way everywhere
- Objects with timestamps
- Files with file types that could be associated with actions

HostFS

- Once Fileswitch was sitting on the filing system vectors, we needed a way for it to pass filing system calls across to the BBC host system – enter HostFS – a bit like a Tube OS
- Much Arthur development was done on A500s using FileSwitch / HostFS driving a bare Tube podule connected to BBC Model B hosts with Winchester HDD

Yay! A hardware bug

- Just before Acorn sent the tape off for ARM2, we noticed that when a particular updated module was loaded, the system would page fault
- Tracked this down as being a module handler exiting with the usual LDMFD SP!,{Rn, ..., PC}^ in the last word of the last page in the module area
- ARM pipeline would correctly stall if it encountered an unconditional branch and so wouldn't read off the end of that page, but didn't for LDM with PC in the register list

It’s not ready!

- Despite howls of complaint from the developers, Arthur 0.20 was dumped onto EPROM in June 1987 for the Archimedes launch
- A305: 512KB / A310: 1MB with floppy drive (HDD optional podule)
- A440: 4MB with HDD controller onboard for ST506 drive. 20MB?
- Several other iterations were dragged out of us before we were reasonably happy

Arthur 1.20

- OK, Computer
- It’s colourful...

Archimedes A310
running Arthur 1.2 Desktop
Credit: Chris’s Acorns

Backups?
I don’t have time for backups!

- We’d been given Italian? Master Compact floppies to do backups on
- Magnetisation lasted long enough so that a first *Verify command would work but wait just one minute and then ... error
- Lesson learned! Spend some money.

The Road to RISC OS

- Arthur 1.2 clearly wasn't the destination
- Many, many improvements were made, especially the introduction of co-operative multi-tasking and then Neil's whizzo idea of allowing applications to hot-desk at &8000
- We all set to writing some applications for this; I did Configure and ModeMaker, Richard did Draw and Tony did Paint

The Road to RISC OS: Infinity

- I write the Filer as a desktop task module
- Worked on the Desktop Open/Load/Save protocols with Neil
- One day, I got a 'Too many windows' error
- Neil, I thought you said there were an unlimited number of windows?
- Yes, you can have up to 32
- Can you make it unlimited?
- Oh, 'spose so... It's infinite now
- Next week...
- Is infinity 64 perchance?

The Road to RISC OS

- Our glorious leader Paul Fellows left during this period (early? 1988) to work on the Cambridge Computer Z88 for Sir Clive Sinclair; Paul Bond, Tim Routsis and Mark Colton worked on its software
- Our new team leader was William Stoye; William wrote Edit
- Arthur continued development under that label (ISTR a period where it masqueraded as Richard III) without any further interim releases until after 1.90 when it magically transformed into RISC OS 2.00

Please release me, let me go

- The day came when improvements had slowed to a trickle and it was time to set it free
- I see screenshots around of the boot screen showing ‘RISC OS 2.00 (15 Sep 1988)’ and suspect they are from A500 EPROM sets because just after the release I went on holiday...

[‘*How can we contact you?*’ ‘*You can’t.*’]

Lawyers!?#

- ...and on my return was told that '*our lawyers are worried*' about being sued by IBM - they thought it similar to the name OS/2 (!#)
- Could it be patched to not show 2.00?
- The string was output using SWI OS_WriteI. Truncating the string by overwriting the end with zero bytes was OK because ARM opcode zero was a NOP (ANDEQ R0,R0,R0)

Give it headbutts

- After finishing the RISC OS ROM, somehow I got assigned to do the production test code for the shiny new FileStore E01S and its friends the E40S and E60S
- That was dull
- Back to using a BBC Micro, I'd been spoilt by BASIC V's structured programming features
- The drives we used on FileStore had external thumbwheels to set their SCSI ID. The initial manufacturer's drives seemed to read their SCSI ID for each command received, so it was easy to provoke a SCSI error by changing the drive's SCSI ID on the fly. This helped show that some of the error path handling worked as expected
- However, the drive manufacturer chosen for final production of E40S was different, and must have been (sensibly) caching their SCSI ID at startup. I then had to provoke a few head crashes using a large screwdriver!

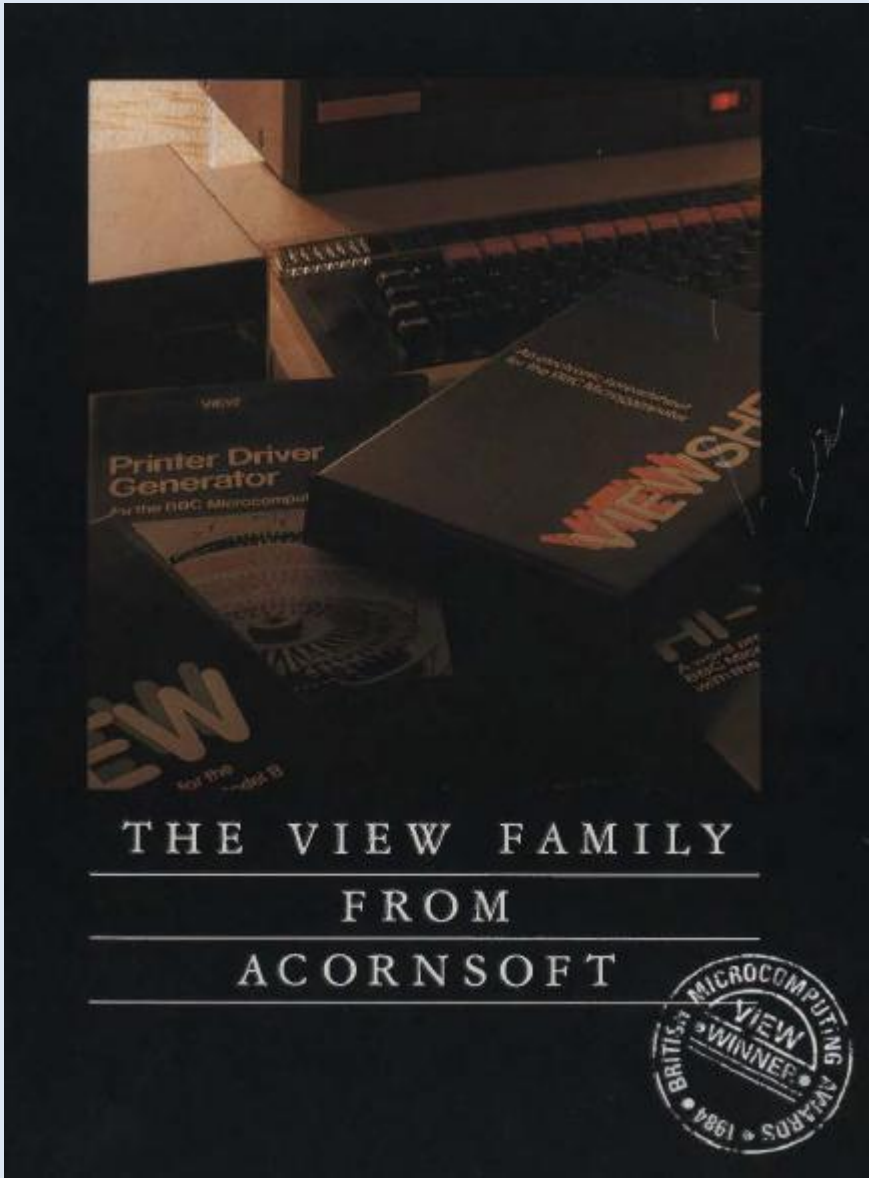
So long, and thanks for all the fish

- I resigned in December 1988 to join Colton Software
- Managers seemed astonished that it wasn't just a bluff to get more money from Acorn

Colton Software

Colton Software – some background

- As you no doubt know, Mark Colton wrote the View family of products released by Acornsoft for the BBC Model B onwards
- Mark had produced VIEW (1982) whilst at Protechnic – I think he was one of its founders
- We'll meet them again later!



Credit: Acornsoft

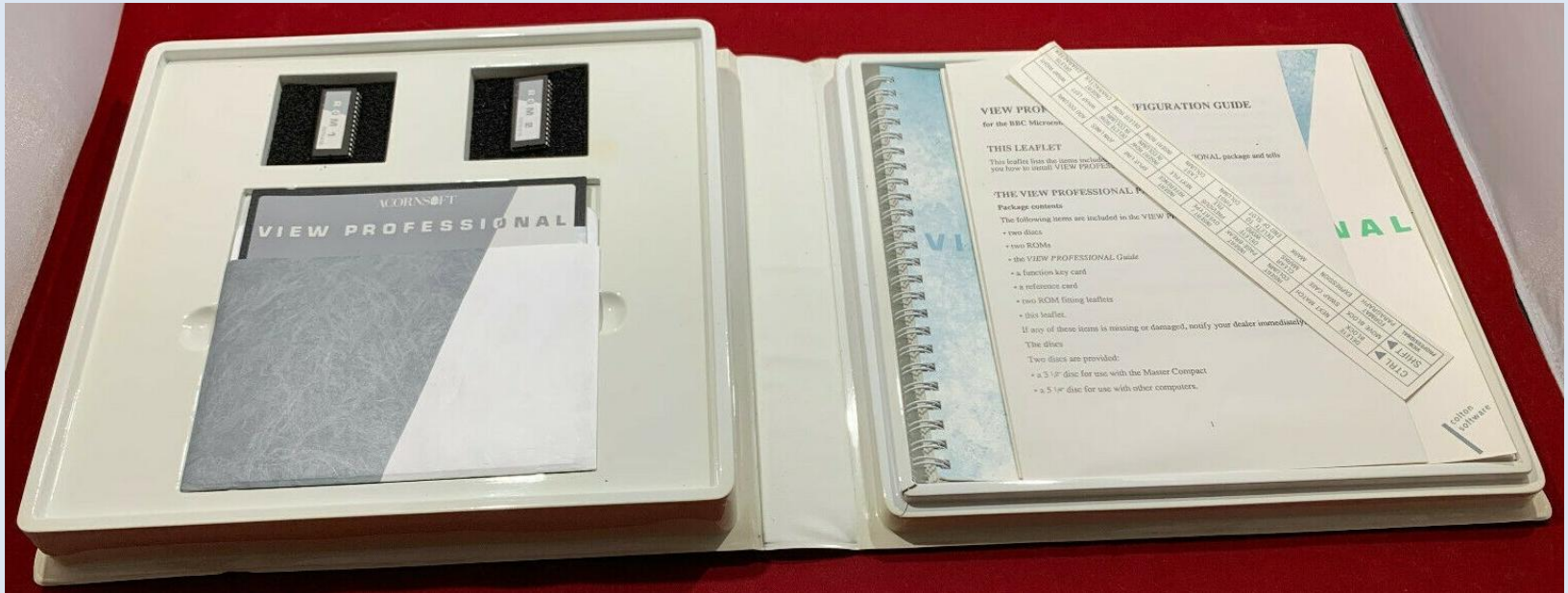
Colton Software – some background

- ViewSheet (1984) and ViewStore (1985) were written by Mark for Acornsoft
- Rob Macmillan headed the Acornsoft Business team that brought these programs to market – next door to Languages
- VIEW and Viewsheet were eventually bundled in the huge Master ROM
- An all-singing-all-dancing OverView program bundle package was sold to accompany this

Credit: Acornsoft

View Professional

- Wanting to provide a package that could integrate the best features of word processing and spreadsheets whilst working in a single document, Mark produced View Professional for the BBC Micro in 1987.
  I think that this was the first product designed by Colton Software Ltd. the company

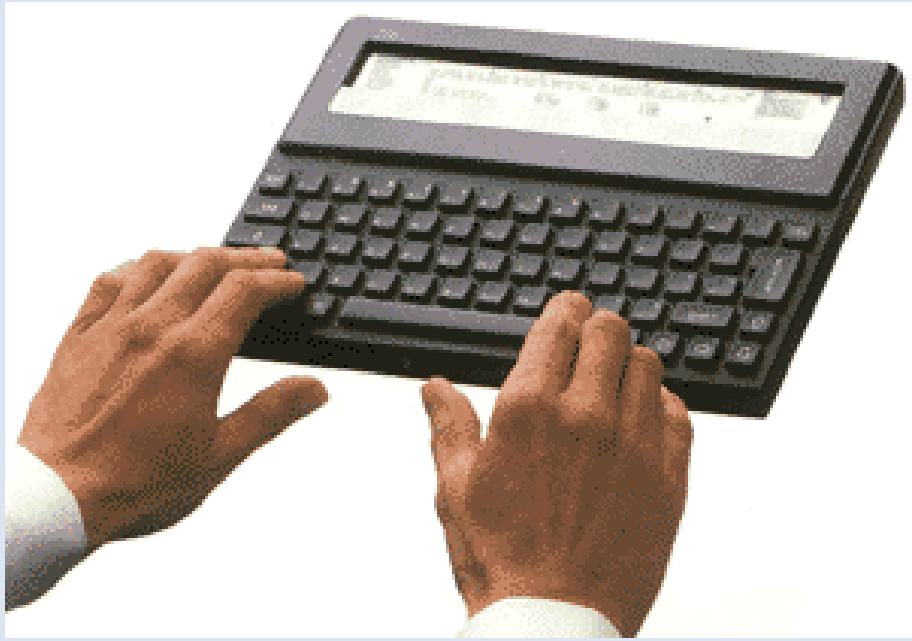


Credit:
CJE/4D

Z88 PipeDream

- View Professional was rewritten by Mark – in Z80 assembler – for the Cambridge Computer Z88 and re-christened as PipeDream

- There are still lots of die-hard Z88 users!



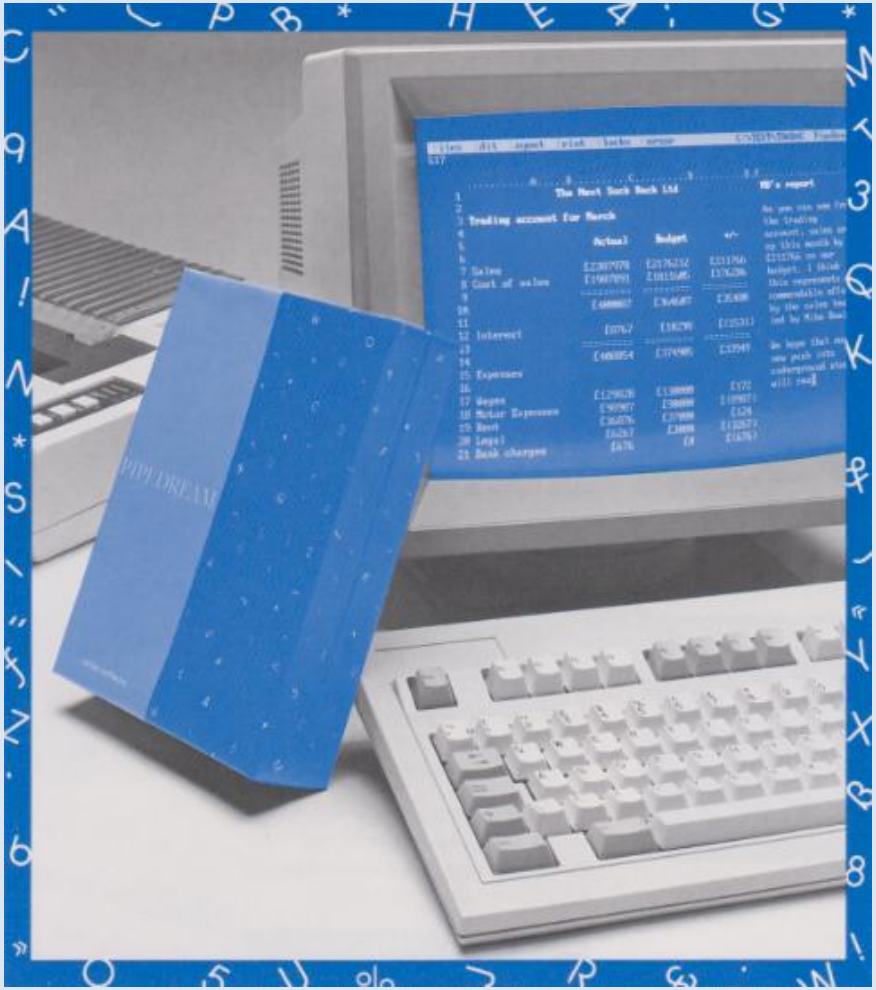
Credit: rakewell.com

PipeDream 2

- Whilst more than comfortable with assembler, Mark thought it would be more productive to use a portable language for future developments, especially given the rapid growth in available memory and CPU power
- Mark and Rob (Macmillan) started writing PipeDream 2 in August 1987 using C.
  It came out on the PC (on MS-DOS) and then the Archimedes (on Arthur)

PipeDream 2

- I believe that PipeDream 2 began as a functional translation of the Z80 assembler code to C
- Most function names and identifiers in the source are six characters (or fewer) – as they would have been for Mark's Z80 assembler
- PipeDream allowed you to connect to a Z88 and share files directly back and forth



Credit: Colton Software

PipeDream 3

- This is where I come into the Colton Software story
- I joined January 1989
- Goal was to add a RISC OS GUI to PipeDream, with fonts and windows
- And charting...

Credit: Colton Software

Colton Software

- Our office was out west of Cambridge in the village of Hardwick, above a garage workshop
- There was a good greasy spoon at the A45 roundabout within walking distance for lunch
- It was my first experience of commuting beyond walking distance
- As I didn’t drive when I started it was a two-bus journey
- Passed test and got a crappy orange Polski-Fiat

PipeDream 3

- Development was done on both the Archimedes for RISC OS — the intended target — and also on the PC, still on MS-DOS (and Rob's PC was a 286!)
- I see that the first multi-document PipeDream appeared in April 1989 – much grokking of the code sorting out static variables into program globals and document locals
- The MS-DOS version didn't have windows of course, but you could cycle round loaded documents

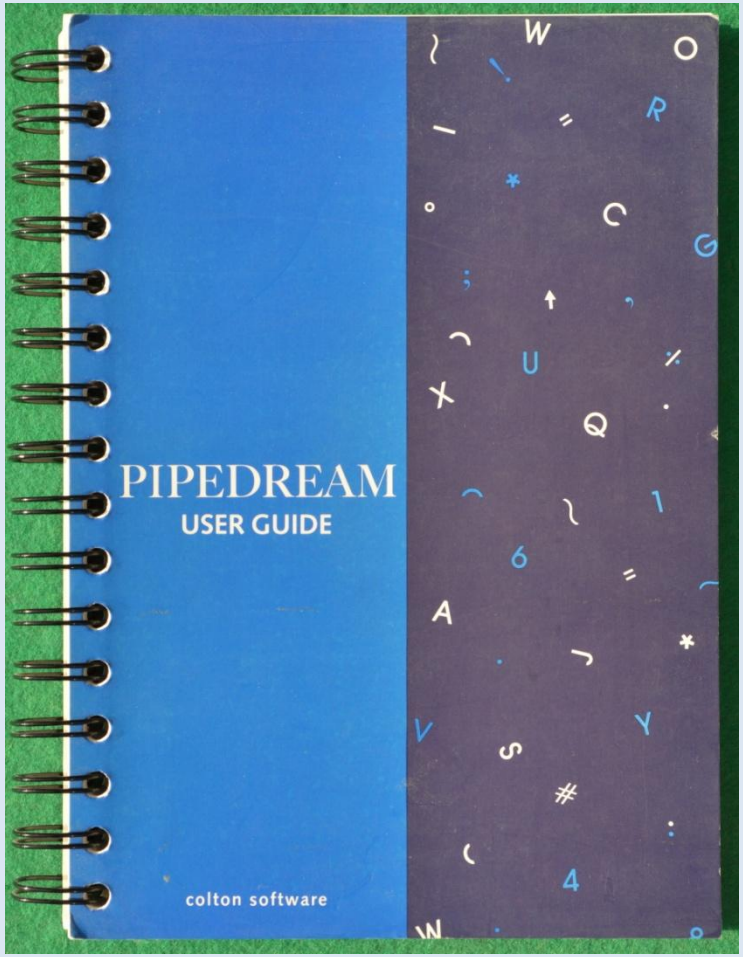
PipeDream 3

- Mark was already working on ideas for what would become Fireworkz
- A couple of these were shoe-horned back into PipeDream 3:
  - a sparse allocator to save memory with non-adjacent spans of cells
  - a new spreadsheet engine with dependency graphs to enable ‘natural’ recalculation rather than by column or by row as before

PipeDream 3

- PipeDream 3.00 was launched at the BBC Acorn User Show at Alexandra Palace,
  held 21–23 July 1989

- This version of PipeDream still allowed you to connect to a Z88, but using a separate filing system module accessed using the RISC OS Desktop Filer



PipeDream 3

- We'd been pulling increasingly long stints as the show approached
- I think I got two hours sleep the night before the show
- Driving back home to Cambridge that evening it was about ten minutes before we realised that we were going the wrong way (on the right side of the road, thankfully!) around the North Circular

PipeDream 3

- Still without native chart support, we came up with a scheme to allow third party code dynamic access ‘DDE’ to PipeDream’s cell data in November(?) 1989
- We got this going with Presenter GTi and Minerva's chart program too I think
- We also produced a German version of PipeDream 3, with documentation (this may have been bundled by Acorn in Germany).
  And were commissioned to do a Swedish one too
- PipeDream 3 maintenance ground to a halt in September 1991 with the release of PipeDream 4 just around the corner

PipeDream 4


4:
PIPEDREAM 4
TUTORIAL
4:
PIPEDREAM 4
REFERENCE GUIDE
colton software

PipeDream 4

- Richard Manby had joined us from Acorn
- Intention being to free me up so that I could get on with writing the charts module
- Richard improved the window handling and added the single-line and multi-line formula editing facilities it still has – he wrote the latter with a multi-line editing module designed for its subsequent use in Fireworkz

Backups are good

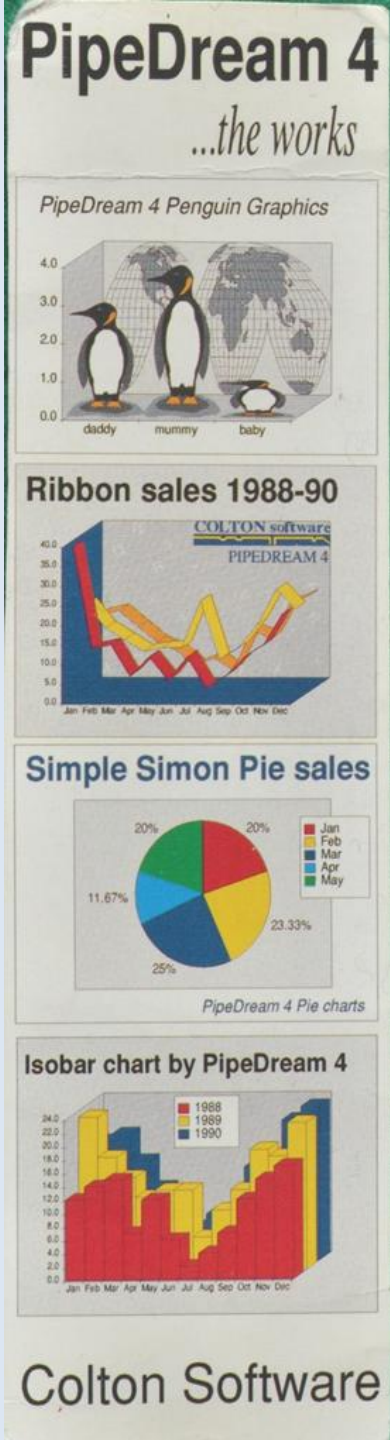
- We backed up our fileserver daily onto QIC tape
- Each day I'd bring a tape back into work and put last night's backup tape in the car ready to take home
- This helps you feel smug when there are flames licking the building

On the move

- Colton Software got one of the nice new offices in Signet Court, just off Newmarket Road (by the scenic scrap-metal dealers!)
- Mark and I spent a couple of days prepping the office, installing Ethernet (coax) and Econet throughout

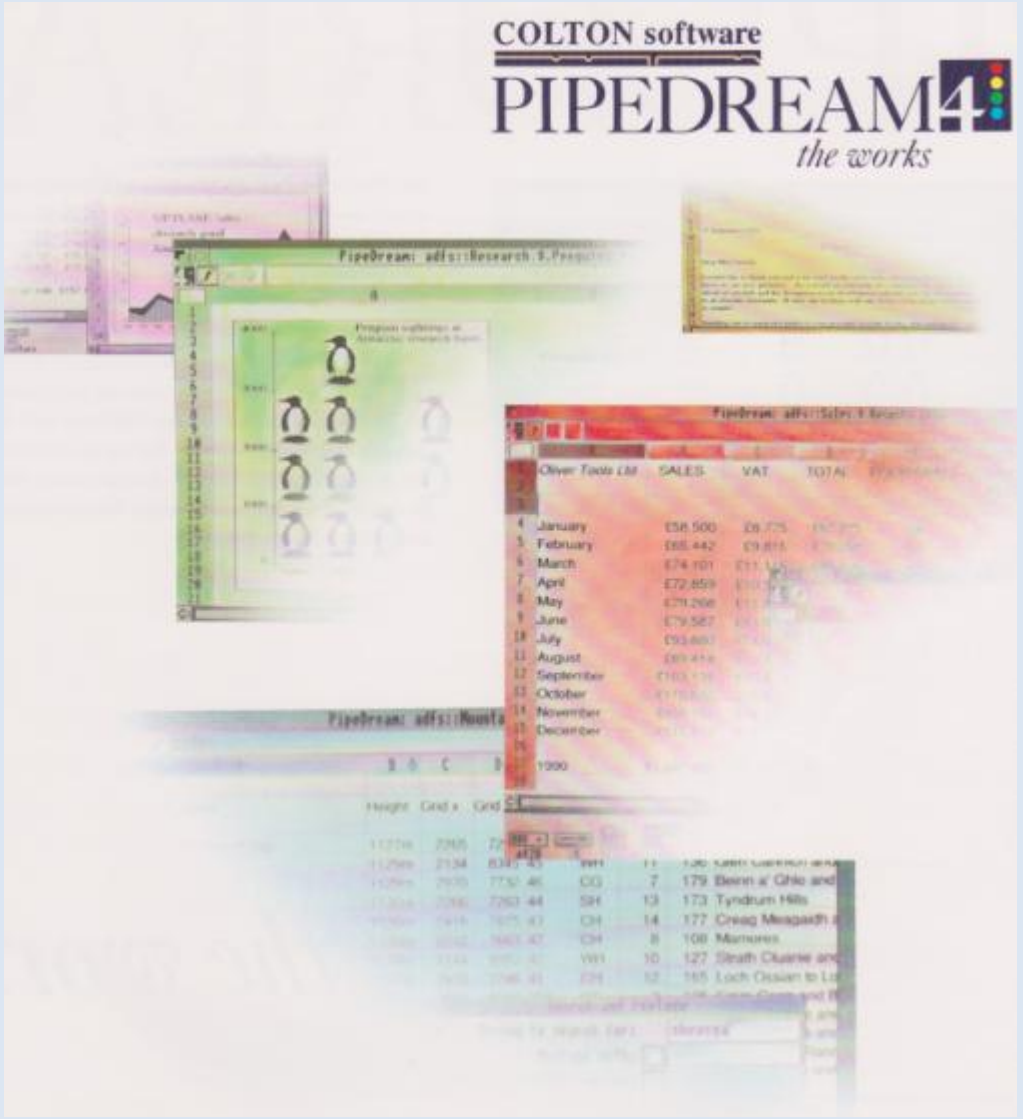
PipeDream 4

- 1991 was spent working hard on charts but – increasingly worrying to Mark and Rob – with zero visible output!
- Because we were intending to reuse this code for charting on Windows eventually, I was producing an intermediate representation
- Draw objects only began to appear from that about ten days before its first outing – and then in rapid succession
- *Penguin Graphics* was born!



PipeDream 4

- PipeDream 4.00 was born on 10th October 1991, just in time for the show!



Credit: Colton Software

Fun and games

- Mark arrived in the office one day with a couple of Scalextric boxes
- We had loads of room upstairs so set the track up there
- I think this one had the Senna / McLaren and Mansell / Williams cars from 1992
- ‘Mansell’ crashed a lot (driver error)

PipeDream 4

- It continues to have a faithful following
- Some people had continued to use it to run their business until they recently retired!
- There's a quote from me in Acorn User in late 1996 where I had said something like

  "*We've tried to put PipeDream to bed so many times that we've given up*"

PipeDream 4

- PipeDream 4 development ground to a halt in 2000, only picking up again in 2012 with the release of a 32-bit compatible version
- PipeDream 4 is now open-source
- Free to download from PlingStore or PackMan

The Fireworkz Family

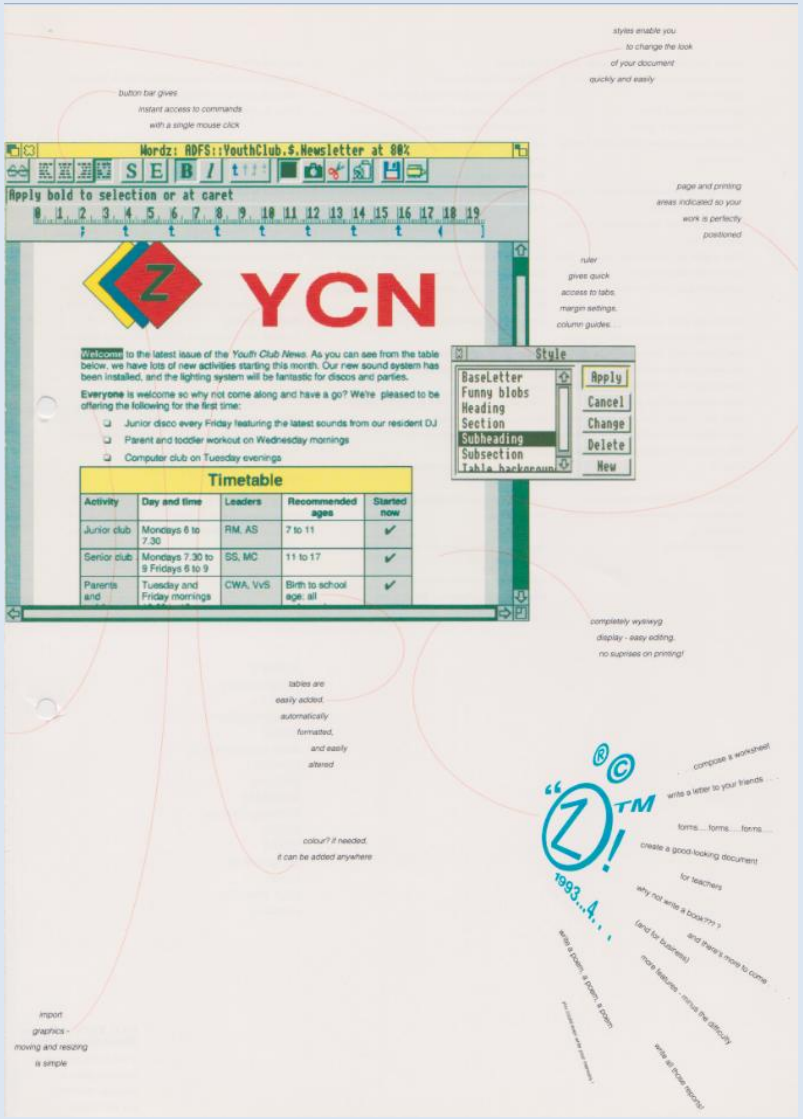
- Designed as a modular product, with object modules that service calls were passed around, exposing tables of commands. Sound familiar?
- The idea was that if users didn't want a word processor, they could just buy the spreadsheet, but the interface would very similar and files compatible – the word processor could import tables of data if sent a spreadsheet by someone
- It also gave us the opportunity to get the first product to market quicker, rather than waiting for everything to be developed – important for our cash flow!

t5

- We had some debate about the name for this – my personal favourite was Chimera
- First referenced by Homer, it was a terrifying fire-breathing hybrid creature
- Its working name internally was Type5, hence the t5 directory in the source tree

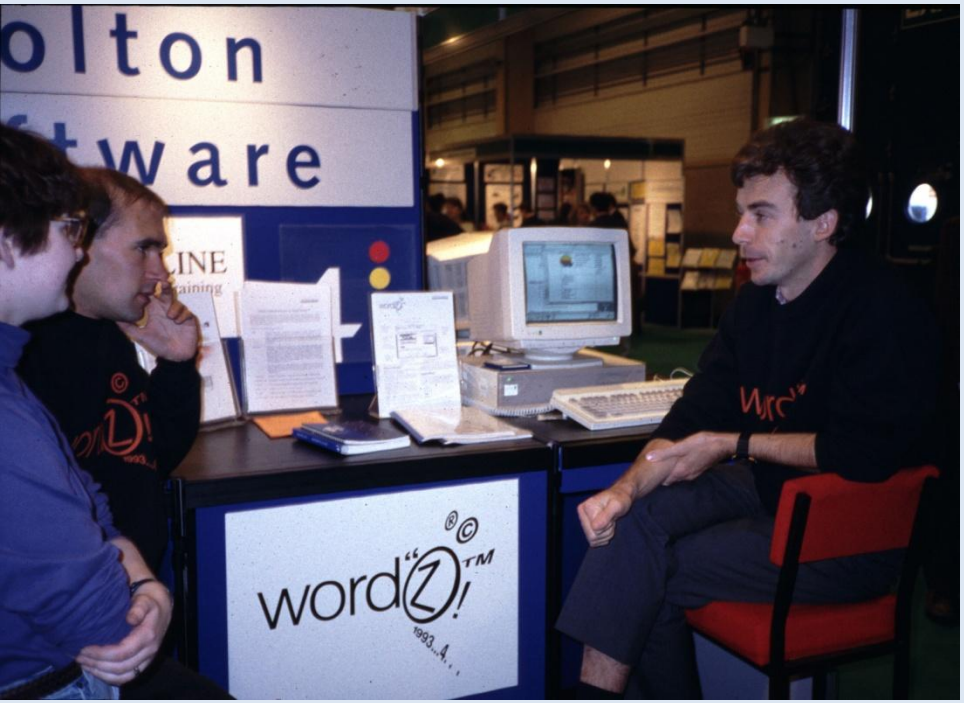
Wordz

- Wordz is the word processor member of the Fireworkz family
- First released January 1993



Credit: Colton Software

Wordz launch



Carol Atack, Rob Macmillan and Mark Colton

Acorn World October 1992

Wordz was still a bit beta!

Adrienne hard at work – as usual!

Resultz

- Resultz is the spreadsheet-only member of the Fireworkz family
- Launched August 1993

Fireworkz

- Fireworkz is what you get when you convolve Wordz with Resultz!
- First release October 1993 on RISC OS; Q3? 1994 on Windows

Fireworkz

- Fireworkz is now open-source
- Free to download from PlingStore or PackMan

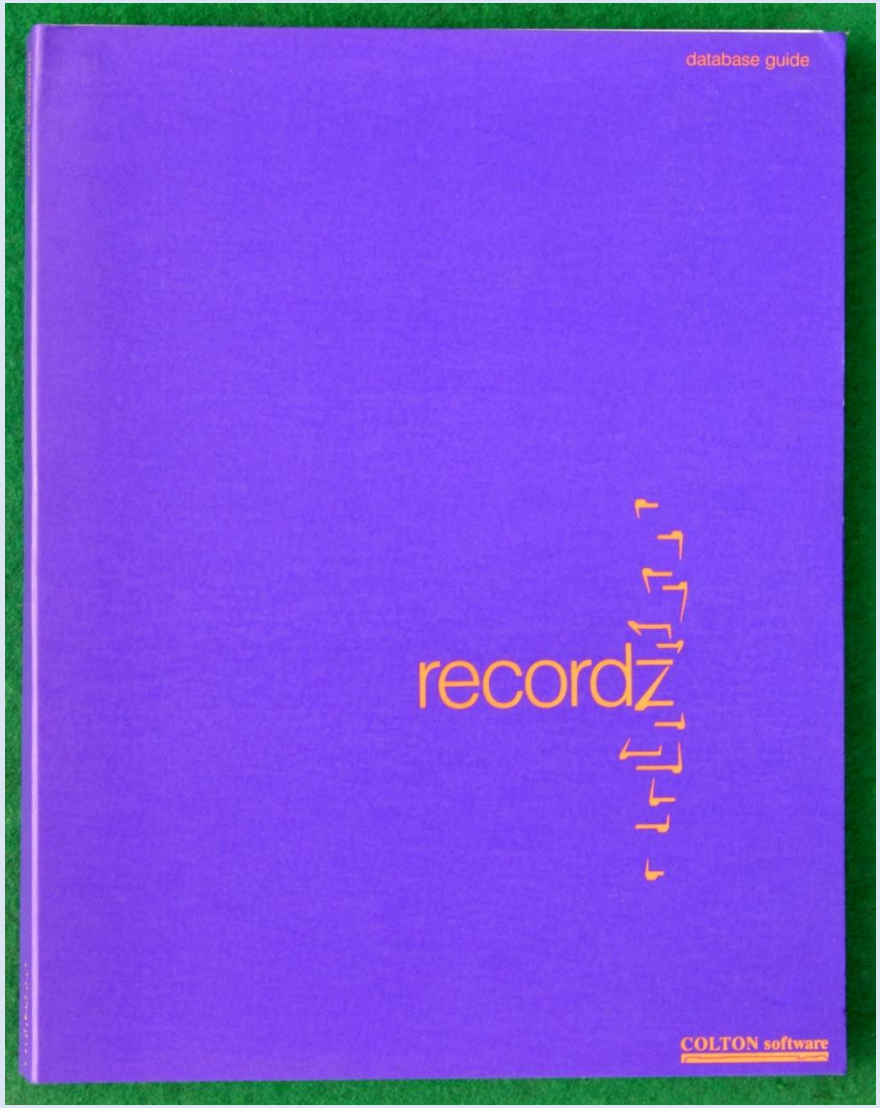
Mark and Motorsport

- Mark had inherited a passion for motorsport from his father, Richard
- British Hillclimb Championship, best 2nd 1994

Mark in his Roman-Judd V8, Barbon hillclimb, 1994

Recordz

- Recordz is the database-only member of the Fireworkz family
- Launched early 1995
- I don’t think we pushed it hard so as to not go up against Iota’s DataPower



Fireworkz Pro

Fireworkz Pro

- The culmination of all our efforts over the past five years
- Paul Fellows did most of the integration of the Iota DataPower engine and the necessary UI
- Finally released in February 1995
- Full integration of the word processing, spreadsheet, database and other modules
- A true Chimera!

Fireworkz Pro

- This is still available to purchase from R-Comp
- To coincide with this talk, R-Comp are running a half-price offer – it's never been better value! Hint, hint.

Colton Software and Protechnic

- Colton Software sales in 1994 were poor, having launched no new products
- We didn’t see a future in the Acorn market
- Protechnic had recently moved in a few doors down from us in Signet Court in Swann’s Road
- After a bit of discussion, Colton Software and Protechnic were to merge late spring 1995
- Paul left before this happened

Colton Software and Protechnic

- The other Protechnic directors thought that Mark ought to have a larger office so he reluctantly moved downstairs to the former ‘board room’
- I think this was April 1995
- The PHC programming team from Protechnic began to be moved into Number 2
- Anne Beeson was sent over to Number 2 to manage the PHC programming team there and ended up in Mark’s previous office, next to mine
- A lovely lady, we became good friends
- Much curry was consumed at the Taste of Bangladesh just down the road

A tragic loss

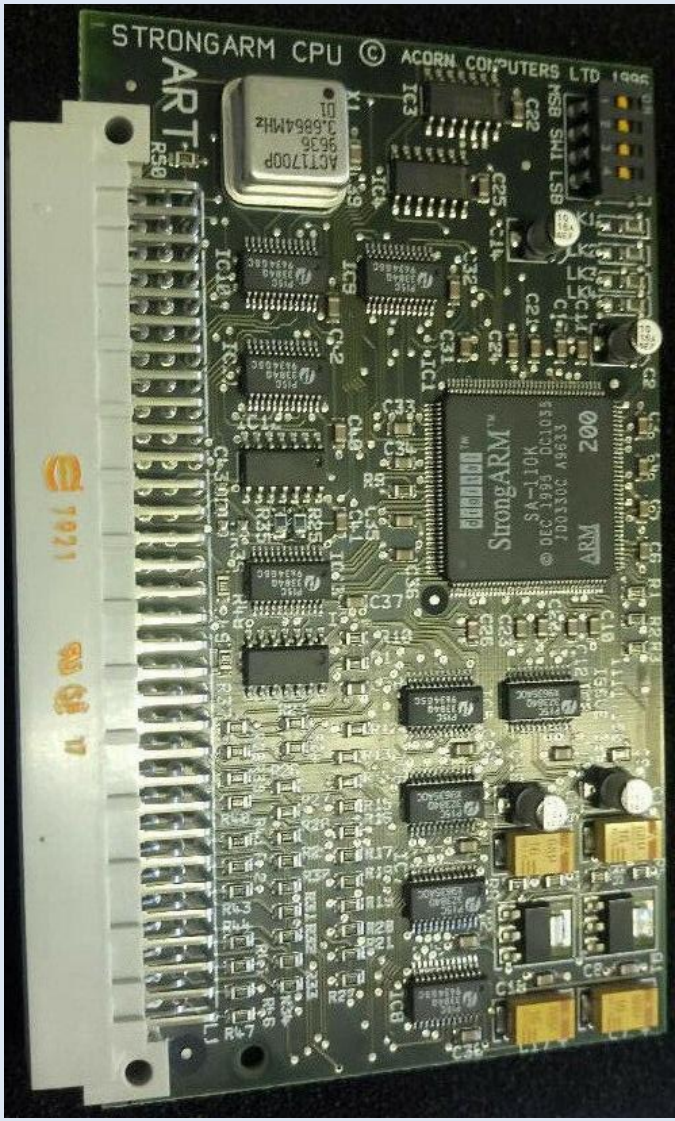
- Mark Colton was killed in his Pilbeam-Judd MP72-02 during a practice run at the Craigantlet hillclimb circuit in Northern Ireland on 5th August 1995
- A front wing collapse at high speed led to immediate loss of control with the car hitting a telegraph pole
- Sadly missed by his friends and colleagues

Colton Continues

- After Mark's death, Protechnic continued to sell and support PipeDream and Fireworkz under the Colton Software banner
- I got less time to work on them!

StrongARM

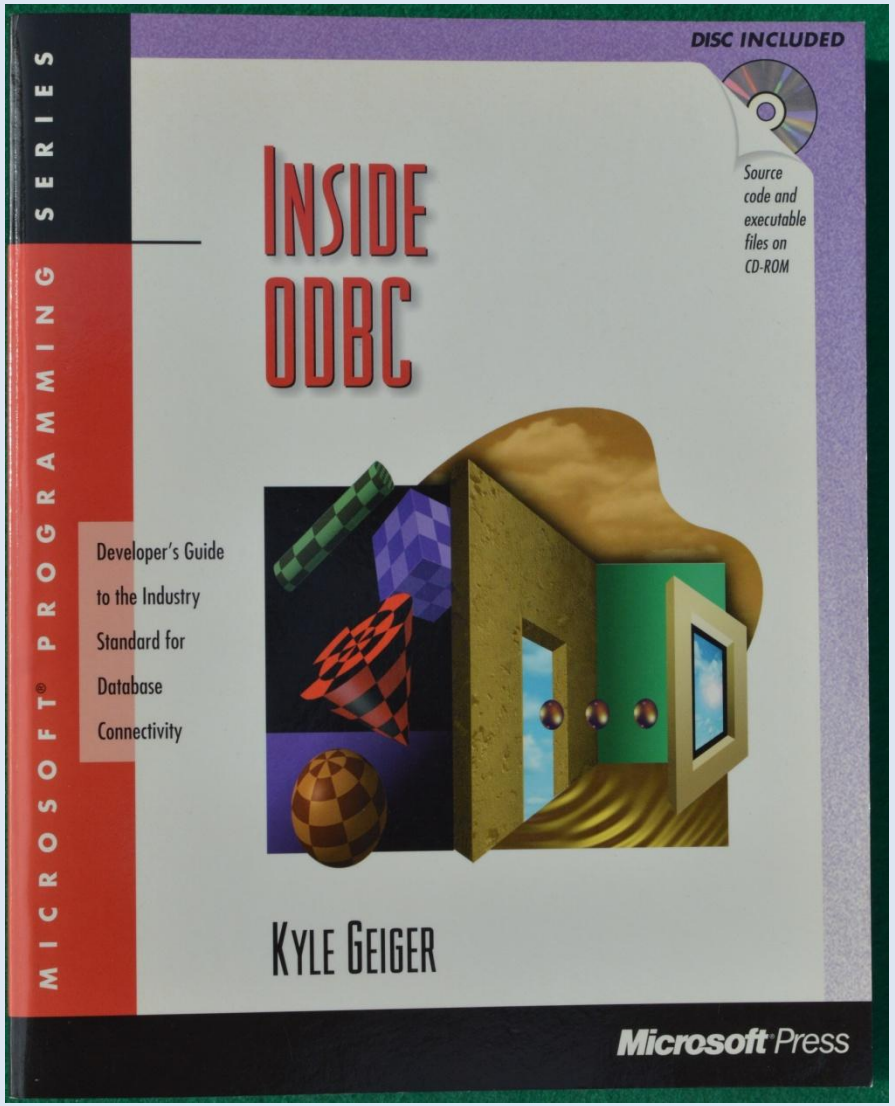
- An unexpected bonus for Colton Software but a pain in the wallet for users
- We needed to modify PipeDream and Fireworkz to be StrongARM compatible
- These were launched at Acorn World in November 1996 (Olympia) with a flurry of sales
- I think this is the last Acorn show I went to



Credit: CJE/4D

Protechnic: OBDC

- Protechnic needed to open up their database for interrogation by Windows-based clients
- ODBC was the key to this



Primagraphics

- Based in Litlington, nr Royston
- Graphics processing
- Radar input, display and tracking
- All VME cards when I joined in April 1998, usually controlled by some Unix-flavour system
- Embedded Motorola 68020 and TI TMS34020

Primagraphics: TDP

- First application I worked on was a Terrain Data Preparation system (SPARC/SunOS)
- Scan paper maps, correct for distortion
- Then add & edit block & polygonal features with attributes
- A bit like Draw and Paint combined!

Primagraphics: Boing!

- “Avionics designers from The Boeing Co. in Seattle needed video interface modules for the avionics of the United Kingdom new maritime patrol aircraft called the Nimrod MRA4. They found their solution in VME video interface boards from Primagraphics Ltd. of Litlington, England”
- “The commercial off-the-shelf ruggedized boards will mount aboard the aircraft, where they will scan-convert video signals and distribute them to the pilot’s display, to a video recorder, and to several other computer workstations”

Primagraphics: PCI

- PCI radar interface and scan-conversion cards
- Lower cost systems (still expensive!)
- I did the device drivers and the C interface libraries for the PCI cards, also integrating these into the higher-level control libraries
- Also did an application tying it all together into one user-friendly package, a good demo programme – so we sold it...
- Optional remote secondary surveillance radar integration

Centurion Digital Radar Recorder

- March 2002: Primagraphics (www.primagraphics.net), the command & control, video and graphics specialist, has won a contract from the United States Federal Aviation Administration (FAA) to supply its Centurion commercial-off-the-shelf (COTS) digital radar recorder and display unit.
- Engineers at the FAA's facility in Oklahoma City needed a cost-effective portable recorder to capture ASDE-3 (airport surface detection equipment) radar video at its various sites across the United States. Once collected the digital data may be replayed into standard ASDE-3 display and processing equipment for testing or analysis.
- Jeff Lyons, ASDE-3 operations project lead engineer, said: "Centurion offers advantages over conventional radar recorders as it records data digitally enabling the data to be replayed many times without degradation or loss of quality. It also includes the facility to re-construct the recorded radar signal which is useful for test applications. This is a company that looks out for the customer."
- Centurion is supplied to the FAA as a stand alone system packaged in a rugged, transportable enclosure making it quick and easy to set up in the field. The self-contained, menu controlled system comes complete with a built-in radar display.

Back to RISC OS

- We were approached by Castle to do a 32-bit version of Resultz for them to bundle with the Iyonix, which I released in November 2002
- Also produced the first 32-bit Fireworkz to sell as an upgrade to that
- That was the last Fireworkz for RISC OS activity until April 2011!
- 32-bit Fireworkz Pro appeared later that year with a new DataPower engine from R-Comp

Highland Perthshire

- An opportunity arose to move to Aberfeldy and we bought East Croftnuisk in October 2002
- I left Primagraphics in September 2003
- Trying not to work too hard, I did some consultancy on-and-off for various companies including old friends at Primagraphics, Amino and AlertMe
- Primagraphics: new PMC-based cards
- Amino: AmiNet 103/110 Qt/Opera browser integration; video subtitling integration
- AlertMe: customer hubs to central systems network load-balancing

What am I doing now?

- It’s best described as ‘Estate Management and Wildlife Conservation’

What am I doing now?

- It's best described as 'Estate Management and Wildlife Conservation'
- i.e. I mow the garden (infrequently) and ensure that the birdies and red squirrels are well fed!

What am I doing now?

- Enjoying bashing rocks: I did a Geoscience degree with the Open University from 2005–2009
- Currently Treasurer — and Webmaster — for the Open University Geological Society
- Keeping Fireworkz and PipeDream healthy!
- Pleased to see so many people still using them in anger

Living in the past

- Whilst it's nice to have the newest shiny, not everyone can afford to update each time, especially schools that have bought a shed load of systems (that’s not relevant now is it!)
- I was disappointed that RISC OS 3.5 wasn't made available for pre-RISC PC systems
- I only dropped support for RISC OS 2 with the 32-bit versions of PipeDream and Fireworkz as there wasn't a 32-bit SharedCLibrary that'd work that far back
- Even now PipeDream and Fireworkz will still run OK on RISC OS 3.1 using System Font. And that's a mere 28 years old!

Modern times

- I now use this little beastie for RISC OS development
- An R-Comp ARMX6 mounted as a parasite on a HP PC – that's just there to provide support and power
- Still C: ROOL DDE 29c
- And a bit of BASIC

Credits

- Thanks to Chris Evans (CJE & 4D) for permission to use some of the images of old systems from their auction site – why not visit them for your retro computing needs?
- Many other images are from Chris Whytehead's Acorn collection available under https://creativecommons.org/licenses/by-sa/3.0/
- All other image credits are with the image; anything uncredited is by me