THE ARM CLUB MAGAZINE

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Don't miss the next issue of Eureka, published in early July, with the latest Club news and up-to-date Risc PC information

WELCOME

The dawning of a new era for Acorn, or just another set of new machines? On the 14th and 15th April Acorn launched the first of its long-awaited new generation of 32-bit ARM computers, known as the Risc PC 600.

For this issue of Eureka we are devoting several pages to the new Risc PC as it does appear to be the most significant development since the Archimedes was launched back in 1987. The Risc PC is an exciting machine and we hope that you will enjoy reading about it. Better still, come along to the Acorn User Spring Show in Harrogate and try one out for yourself.

The Risc PC from Acorn complements its Archimedes range rather than replacing it; the only casualty is likely to be the A5000, and the Archimedes will continue to be sold for some time to come.

The Risc PC overcomes many of the restrictions of the Archimedes range, as you will see in our feature on the new computer. What's more, a whole new world of IBM PC compatibility is opened up with the forthcoming range of PC processor cards which plug into the Risc PC and cost as little as £99 including a copy of DR DOS 6.

This has been a very exciting issue of Eureka to produce, hence its greater than usual size, I hope that you will share our excitement about Acorn's developments.

Simon Burrows

HARROGATE SHOW

The Acorn User Spring Show was already looking set to be a very good Show, but the news that Acorn's new generation of computer will be on display (and indeed on sale) will give an extra spark of excitement to the Show.

The Show is taking place from 22nd–24th April at Hall C of the Harrogate International Centre, and The ARM Club will be exhibiting at the Show, our sixth Acorn / User Show since the Club was founded by Rene Barreto.

The Show itself is themed as parts of a computer, to enter the Show all visitors have to set through a giant monitor screen and the layout of the Show Hall is themed around various parts of a computer. The Club's stand is situated in the Club area where we will be carrying out the usual activities, answering questions about the Archimedes and Risc PC, queries about the Club, signing up new members and welcoming renewals, as well as selling magazine sample packs, public domain discs and some of our new software products.

The new Risc PC will undoubtedly be the focus of attention for many months in the Acorn world, and quite rightly too, but don't miss a number of other exciting developments over coming months. Both Acorn and ARM have other announcements in the pipeline, although these currently have to remain secret. Keep your eyes and ears open, and do try to get along to Harrogate. Enjoy your Acorn!

Introducing the Risc PC

An overview of the highlights of Acorn's new computer

It has long been rumoured that Acorn has had a new generation of desktop computer under development, and over the months a huge amount of speculation has taken place over the specifications, price and release date of these new machines.

The Risc PC, as it is now called, has been under development for roughly two-and-a half years in conditions of great secrecy at Acorn. From the time the A5000 was launched it became clear that Acorn would need a new architecture of computer in order to maintain its position and survive.

The Risc PC runs RISC OS version 3.50, and at face value it might appear that not all that much as changed, but once you start using the machine or take its lid off, you realise that the changes are significant. From a hardware point of view, almost no component has survived the change from Archimedes to Risc PC unchanged, and yet the degree of compatibility with Archimedes hardware and software is very great.

Striking casing

The most obvious change on seeing a Risc PC for the first time is the casing; Acorn has done away with the old Archimedes casing, and indeed the PC style casing of the A5000, and opted for an original design from the company Cambridge Product Design, who styled the original BBC micro.

The new modular casing is extremely expandable – if you need a larger case, it is simply a matter of taking the lid off, fitting an additional expansion slice and re-fitting the lid. The basic machine comes with a single slice, but up to five extra can be fitted. Obviously this makes the computer rather big, but the
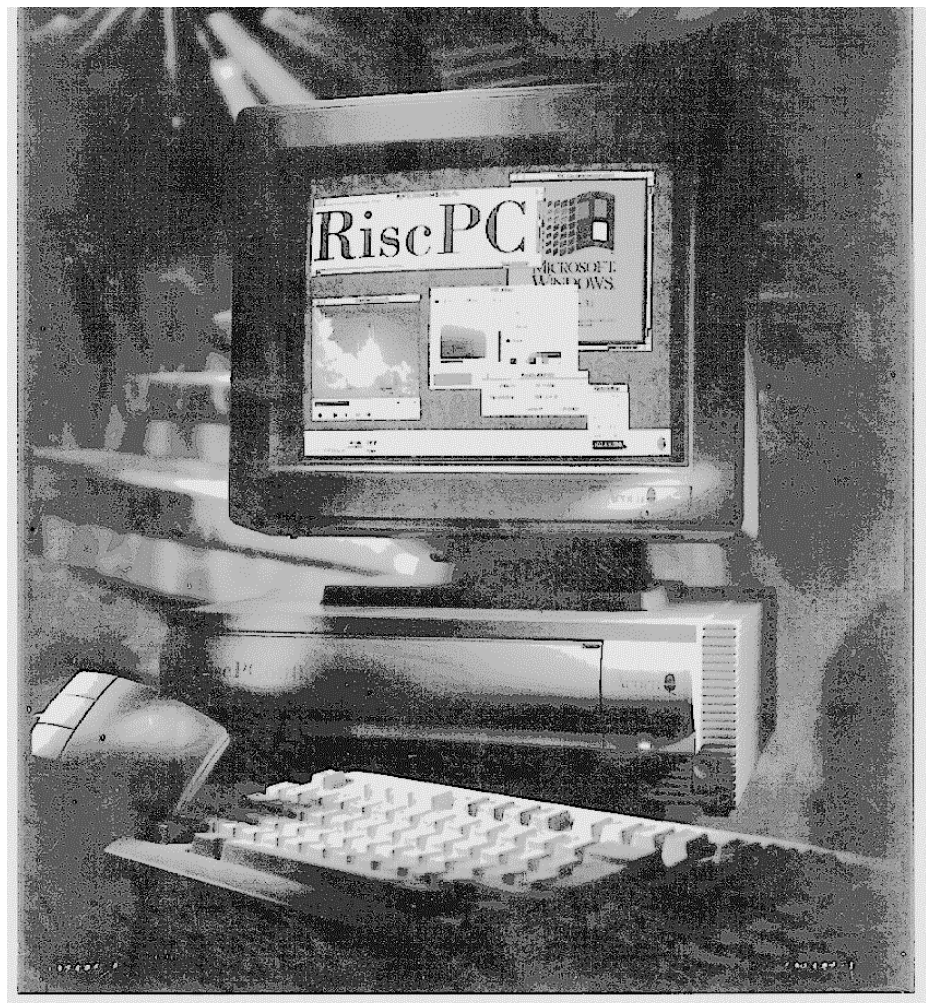
A Risc PC 600 in desktop configuration

case can be used in traditional desktop mode, or a new tower mode, and special clip-on feet are provided to enable this. Each slice of casing enables the machine to be fitted with one or two additional expansion cards (podules), along with a 3.5" device such as a hard disc and a 5.25" device such as a CD-ROM drive.

Along the front of each slice is a spring loaded flap which conceals the drive bays mentioned above. All models of the Risc PC supplied by Acorn come with a standard 1.6Mb floppy disc drive. At first glance these flaps look like an area of weakness, but Acorn assures me that people have even been known to lift a Risc PC solely by its flap (such action is not recommended)! The case itself is moulded from Bayer Bayblend, a mix of tough ABS and polycarbonate normally used to make visors and riot shields! To cut down on electrical emissions, the inside of the case is metal-sprayed, and the walls themselves are 4mm thick with 2mm ribs. In desktop mode, the case can support a monitor weighing up to 16 kg.

...The Risc PC is made to be taken apart...

The basic one-slice case consists of three parts: the slice, the lid and the base which contains the computer's motherboard. The lid is held in place by two glass-filled nylon twist-lock pins, and the whole computer is very quick and easy to open and access.

A major surprise is that there are only two screws in the whole computer, one to hold the power supply unit in place, and one for provide earth bonding. Everything else is held in place by specially designed clips. For reasons of security, padlock holes are provided so that unauthorised persons can be prevented from opening up the computer, important when the computers are exposed to public use, for

example in schools.

The dimensions of the Risc PC casing are as follows: 117mm high by 355mm wide by 383.4mm deep. Each additional casing slice adds 65mm to the height of the case. Upgrades such as expansion cards and processor cards are very easy to fit thanks to guide lines moulded into the case.

Processor

The old Archimedes A540 computer had its ARM3 processor on a removable card, unlike the A5000 for which the ARM3 was surface mounted onto the motherboard, making it very difficult to replace.

The Risc PC uses a similar style of removable processor card to the A540, however there is one major difference, every Risc PC comes with TWO processor card slots side-by-side! These are 96 way DIN sockets.
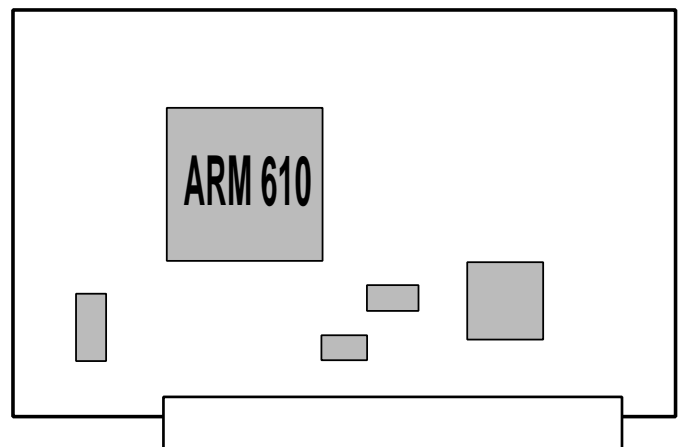
A processor card containing ARM610 & clock

Initially all Risc PC machines will be supplied with an ARM610 processor, as used in the Apple Newton MessagePad computer. This processor is clocked at 30MHz; the clock crystal is mounted on the processor card.

At the end of this year an ARM700 processor card will be produced, and upgrades will be available for existing owners. Next year, another upgrade to ARM800 will also be produced, offering a substantial increase in

performance without needing to buy a replacement computer. Computers fitted with these processors are expected to be known as the Risc PC 700 and 800 respectively.

Video Sub-System

All of the Archimedes range use a video controller called VIDC1a (apart from the A500 development machine which used the VIDC1). The Risc PC uses the updated version of this called VIDC20, which offers substantially improved graphics performance over the existing capabilities. The VIDC20 offers a choice of up to 16 million colours (rather than the 256 colours of VIDC1a), each pixel being represented at a depth of 32 bits (24 for colour plus 8 control bits). The table below gives some examples of the graphics capabilities of the Risc PC.

An important feature of the new architecture is the ability to fit Video RAM (VRAM) to the computer. This is special RAM for storing screen images; it is rather more expensive than ordinary RAM, but improves the graphics performance of a Risc PC significantly. VRAM is not essential — indeed the base version of the Risc PC 600

does not come fitted with any. Either 1 or 2Mb of VRAM can be fitted, upgrades are available from Acorn, and simply plug into the socket provided. The upgrade from 1Mb to 2Mb VRAM requires a replacement VRAM card containing 2Mb, however it is expected that dealers will be able to offer a trade-in service.

Video modes are configurable by the user, allowing tradeoffs to be made between resolution and the number of colours. With 2Mb VRAM fitted, the memory bandwidth into VIDC20 is at least 152Mb per second! The benefit of this "dual port" VRAM (as it is properly known) is that screen modes with high resolution or lots of colours no longer slow down the ARM processor, having a dramatic effect on the overall performance of the machine.

For use in multimedia applications using Acorn Replay (displaying animated films in the desktop), a special 70MHz Replay mode is available offering 32,000 colours at 480x352 pixels, rising to 16 million colours with 1Mb of VRAM fitted. The graphics facilities of the Risc PC are very good indeed.

	Resolution	Colours	Refresh Rate (Hz)	Pixel Rate (MHz)
DRAM only	1280 x 1024	4 greys	60	110
	1024 x 768	16	75	75
	800 x 600	256	56	36
1MB VRAM	1280 x 1024	16	60	110
	1024 x 768	256	70	75
	800 x 600	32000	56	36
2MB VRAM	1280 x 1024	256	60	110
	1024 x 768	32000	70	75
	800 x 600	16m	56	36

Samples of the video performance offered by VIDC20 in the Risc PC

Memory Upgrades

When the Archimedes was first launched, its 4Mb maximum RAM capability seemed massive compared with the BBC Model B and Master 128. However over seven years memory requirements have changed, and 4Mb is no longer enough for many people. The A540 had the capability to take up to 16Mb RAM, but the rest of Acorn's machines struggle to take more than 4Mb. Even 4–8Mb RAM upgrades for the latest A5000 machine cost around £400.

The Risc PC uses industry standard dynamic RAM (DRAM) upgrades in the form of SIMM packages (SIMM stands for Single Inline Memory Module). The type of SIMM required is 32 bit wide, and has 72 bits. The Risc PC motherboard has two sockets for SIMMs, theoretically allowing up to 256Mb of system RAM. At present the limit is 128Mb due to larger capacity SIMMs not being commercially available, but this is likely to change before long. Each SIMM socket can contain a different capacity SIMM, or indeed no SIMM at all.

These SIMMs are widely available for PC computers, and are substantially cheaper than the RAM upgrades for existing Archimedes computers. The initial Risc PC range is fitted with 2, 4 or 8Mb of RAM, but upgrades will not be available from Acorn. This is because the chips are widely available at knock-down prices, and Acorn could not compete on price.

As an added bonus, any video RAM (VRAM) not needed for display purposes is available to the system for general use. For example, if your machine has 2Mb VRAM and only 1Mb is needed for the current display mode, the other 1Mb is automatically made available for general system or application use.

What about the Archimedes?

Acorn has committed itself to continue selling the Archimedes range — after all, the most basic Risc PC costs £1249 + VAT, and so there is still a large market for the cheaper machines. Acorn is continuing to supply the A5000, although it is expected that the number sold will decline drastically, since the Risc PC 600 is a far superior computer for roughly the same price.

Acorn's installed base of Archimedes machines numbers in excess of 300,000, so we can be sure that it will continue to be supported for a long time to come, and since software can be written to run on both the Risc PC and the Archimedes, there's no reason whatsoever to throw your Archimedes in the bin!

A statement has been made by Acorn that portable and further (cheaper) desktop computers will be introduced using the new technology during 1995.

Conclusions

Naturally it is far too soon to draw any real conclusions about the new Risc PC, apart from the fact that Acorn has put a huge amount of resources and investment into this technology, and appears to have come up with a very exciting product,

At first glance the prices of the various Risc PC models and upgrades may seem a lot of money, but Acorn has produced several pages of comparisons with rival computers, including the PowerPC and Pentium equipped computers, and the Risc PC appears to be well-priced in comparison with these, recognising that Acorn is not a charity and needs to make profit in order to survive and grow. The Risc PC has many features to commend itself to both existing and potential Acorn users, and shows that Acorn is on the leading edge of technology, what's more designed and assembled in the UK. It will bring a new lease of life to the whole Acorn community, and we wish Acorn well.

Simon Burrows

Risc PC Pricing Information

The Risc PC 600 is only the first in Acorn's new generation of desktop computers; others are known to be under development. However the beauty of the Risc PC architecture is that it is more expandable than in the past, and so upgrading should be relatively cheap and easy.

Table 1 below gives basic information about the different configurations available from Acorn.

The model number is the order code which should be used to specify a model if you wish to buy one. The code beginning ACB is for the computer, and AKF is for the monitor.

Put simply, there are three different configurations, along with a choice of either a 14" multiscan monitor (AKF60, designed by Microvitec) or a 17" multiscan monitor (AKF85, one of the Philips *Brilliance* range).

The three models have 2+0, 4+1 and 8+1 Mb of RAM respectively, where the first number is the amount of system RAM (DRAM), and the second number is the amount of video RAM (VRAM). The top-of-the-range ACB45 model comes with an extra-large IDE hard disc drive, as well as an additional casing slice, larger power supply and four slot backplane into which expansion cards (podules) may be plugged.

Upgrade	Price ex VAT	Price inc VAT
Tower Option	£99	£116.33
PC Card	£249	£292.57
Ethernet Card	£99	£116.33
Econet Card	£49	£57.58
1Mb VRAM	£129	£151.58
2Mb VRAM	£199	£233.83
210Mb HDisc	£199	£233.83
420Mb HDisc	£299	£351.33
AKF60 Monitor	£325	£381.88
AKF85 Monitor	£999	£1173.83

Table 2: Prices of upgrades

The prices shown above need a little further explanation. The Tower option consists of a second slice of casing, a four slot backplane for holding expansion cards (to replace the standard two slot backplane), a 100W power supply (to replace the standard 70W supply) and all necessary clips.

The PC card simply slots into the second processor slot on the Risc PC motherboard, and costs £249 ex VAT. Using a 486SX processor initially, with a slot for a 487 maths coprocessor, this upgrade will not be available until September (estimated). The price includes a copy of DOS and Microsoft Windows. However, if you order the PC card with your Risc PC, it will only cost £99 + VAT (although this price does not include Windows, only DOS). This option is very good value indeed.

Model No	DRAM	VRAM	VDU size	HD size	Slices	Price ex VAT	Price inc VAT
ACB15 / AKF60	2Mb	0Mb	14"	210Mb	1	£1249	£1467.58
ACB25 / AKF60	4Mb	1Mb	14"	210Mb	1	£1399	£1643.82
ACB45 / AKF60	8Mb	1Mb	14"	420Mb	2	£1699	£1996.33
ACB15 / AKF85	2Mb	0Mb	17"	210Mb	1	£1649	£1937.58
ACB25 / AKF85	4Mb	1Mb	17"	210Mb	1	£1799	£2113.83
ACB45 / AKF85	8Mb	1Mb	17"	420Mb	2	£2099	£2466.33

Table 1: Pricing of the Risc PC 600 range

The Ethernet and Econet expansion cards are a new micro variety which plug into the dedicated networking slot present in the Risc PC. This means that you can have up to eight traditional expansion cards (podules) in addition to the network expansion card. An Acorn Access Pack is also available, priced at £119 ex VAT.

The 1Mb and 2Mb VRAM upgrades are particularly important given the potential graphics capabilities of the Risc PC. If you initially buy a machine with no VRAM, it can be upgraded at a later date to 1Mb or 2Mb VRAM, although understandably this is more expensive than buying a model which comes fitted with VRAM. Strangely (well, for marketing reasons) Acorn is not supplying a version of the Risc PC 600 fitted with 2Mb of VRAM, it is necessary to order the 2Mb upgrade separately. The 2Mb upgrade completely replaces the 1Mb upgrade, so your dealer may be able to offer a trade-in. It is likely that third party companies will be able to offer a direct upgrade since the 1Mb VRAM card has space for the 2nd Mb of VRAM chips.

The hard disc upgrades are fairly self-explanatory. The Risc PC hardware can only support two IDE drives as standard, although a separate SCSI or IDE interface can be used to add more devices. Bear in mind that the Risc PC only supports a single floppy disc drive, additional floppy drives cannot be added without a (hypothetical) third party interface,

The two monitors supplied by Acorn are very impressive, although you may find a 14" model inadequate for DTP or graphics-intensive work. If you opt for a 17" AKF85 monitor with your computer instead of the 14" AKF60, a special price of £400 ex VAT is charged for the improved monitor.

You may be surprised to see that system RAM (DRAM) upgrades are not included in the upgrade list — this is because DRAM upgrades will not be available from Acorn itself. The reason given for this is that standard SIMM modules for upgrading the DRAM are available from a wide range of suppliers, and Acorn could not sell them at a competitive price. Any Acorn dealer should be able to supply upgrades, but do shop around for the best prices! Currently SIMM modules up to 64Mb are widely available, and the Risc PC can take any combination of two modules.

An upgrade for the Risc PC which is sure to prove popular is a CD-ROM drive upgrade, especially since every machine comes ready-equipped with a 5.25" drive bay ready to take such a drive. Acorn itself is not providing such an upgrade, although cheap upgrades are available from companies including Cumana and Morley.

In general, an analysis of these prices reveals that if you can afford the cost, it is worth buying the best possible setup to start with. Remember however that some upgrades such as DRAM, VRAM and additional hard discs are likely to be available more cheaply from third party suppliers.

Disclaimer

Please bear in mind that this issue of Eureka went to press in March, and all material about the Risc PC is based on pre-release information supplied by Acorn, including the prices.

Acorn reserves the right to change the prices or specifications of the Risc PC at any time. Please check the Eureka Magazine disc for any last minute changes known to us prior to the launch. The ARM Club cannot accept any responsibility for errors, omissions or changes in the information given in this magazine. Check the specifications and configurations before parting with any money!

Technical Overview of the Acorn Risc PC

Mark Smith takes the lid off a Risc PC and likes what he sees..

For a long while there has been much speculation about what new machines Acorn might release. Now the wait is over and it's time for a look under the lid.

Doing this is no trouble since the machine has about three screws in total and releasing the lid is simply a matter of releasing a couple of twist lock pins.

The mother board contains two main chips. One of these is VIDC 20, an enhanced version of the sound and video controller used in existing Acorn machines. In addition VIDC 20 can handle new 32 thousand and 16 million colour and very much higher resolution screen displays and supports the use of dual port video RAM where fitted so that very high colour / resolution displays can be used without compromising CPU performance. It can also generate 16 bit CD quality sound, although to make use of this, an appropriate digital to analogue converter will be required. This forms part of a sound upgrade card to be released later by a third party in collaboration with Acorn. The old 8 bit sound facilities are provided pretty much unchanged, although the filter now has a much sharper high frequency cut-off giving a much better sound quality.

The other chip is IOMD, a proprietary IC designed by ARM Ltd. to Acorn's specifications. It is a combined memory management / bus master / CPU / DRAM / VRAM / peripheral manager / DMA extended bus manager / controller, taking most of the functionality of MEMC and IOC used in Archimedes systems as well as performing new functions. Next to the IOMD there are two 96-way DIN connectors. The first of these holds a processor card in much the same way as the Archimedes 540 had its processor on a plug in card. The processor is placed on a card to allow an easy upgrade route to future ARM processors. All the machines will initially be fitted with a 30 MHz ARM 610 card, which can be upgraded to an ARM 700 card later this year and an ARM 800 card clocked at 50 MHz or faster by the beginning of 1996. Acorn has given a guarantee on the pricing of these upgrades: details arrived too late to appear here, see the Eureka disc for full details. The 30 MHz ARM 610 has a performance of around 40 Kdhrystones (assuming video RAM is fitted), which is roughly the same as a 66 MHz 486DX/2 machine and about twice the speed of a 25 MHz A5000, the ARM 800 performance should be at least three times that.

The empty socket next to the processor is a clue to one of the surprise features of Risc PC, that being the use of a dual processor open bus, supporting any processor as a second bus master. Initial rumours suggested that a socket

for an Intel processor would be provided, although Acorn have come up with something far more versatile than this. The second processor can be just about anything you like including a second ARM processor for digital signal processing (DSP), network processing or graphics processing. Alternatively a "foreign" CPU such as an Intel 80x86 or Motorola 680x0 processor can be used. In any case all that is needed on the card is a processor, a clock crystal and an application specific integrated circuit (ASIC). This provides bus arbitration so that both processors don't try to access it simultaneously and, where a foreign processor is being used, interfaces it to the protocol of the open bus. The fact that an Intel processor can be fitted on the main system bus alongside the ARM immediately opens the prospect of cheap hardware PC compatibility, since it can share most resources including memory with the ARM. Acorn themselves are working on a 486SX upgrade card (expected release, September 1994) which will retail for £249 ex VAT including DOS and Windows, and is expected to be clocked at 40MHz. If you purchase it bundled with a machine it only costs £99 ex VAT (excluding Windows), not much more than the current cost of *PC Soft*! It is expected that future cards using the 100 MHz DX4 and Pentium P24T processors will be developed.

Across on the right-hand side of the motherboard is a slot for a proprietary VRAM and two for industry standard DRAM SIMMs (single-in-line memory modules). The VRAM slot takes a board containing either 1 or 2 Mbs of dual port video RAM. With the full complement of 2 Mb fitted it is possible to have a 16 million colour SVGA (800 by 600) or a 256 colour XGA+ (1280 by 1024) display with no degradation of CPU performance. If the video RAM is not completely used for the screen display, it can be used for other purposes just like DRAM.

The two SIMM sockets can hold any combination of SIMM modules up to a maximum total of 256Mb which should be more than adequate for a few years. The SIMMs must be 72 pin with a 70ns or faster access time.

Risc PC can take two expansion cards for every centre section in the system. Expansion cards are connected to DEBI — DMA Extended Bus Interface via a backplane which will have either 2, 4, 6 or 8 slots depending on the number of centre slices the machine has. Only 2 and 4 slot backplanes are currently available from Acorn. Most existing 8 and 16 bit Archimedes expansion cards are compatible with Risc PC, although only the single width ones — old double width cards cannot be accommodated within the case. Some existing cards may only work in slots 0 to 3, although most developers of such cards should be able to provide ROM upgrades to solve this problem. New expansion cards developed specifically for Risc PC can take advantage of a 32 bit IO bus. Also, as implied by its name, DEBI supports direct memory access (DMA). This means that an expansion card, for example a SCSI interface, could transfer data directly to or from memory without interrupting the processor. Furthermore, in addition to the 4K of address space allocated to each card a further 16Mb called EASI (Extended Acorn System Interface) space is available. This means that any data held on the card in RAM or ROM is accessible directly by the processor without having to page it into a 4 KByte area. The upshot of all this is that expansion cards can now transfer data to or from memory much more quickly than before, opening the way for fast SCSI II, direct-drive printer and data capture interfaces. If the on-board video facilities are not adequate, a video expansion card could carry up to 16 Mb of video RAM providing even better resolution and more

colours although this is unlikely to be required except for specialist use.

A connector is provided on the motherboard for a new type of network card. This is similar to an expansion card in that it can contain a ROM containing an appropriate AUN driver module and any other modules necessary for the particular type of network in use. Econet and thin Ethernet are available now.

Looking along the back of the machine, you will see standard 25 and 9 way D connectors for parallel and serial communications respectively. As with all machines since the A5000, the parallel port is bi-directional, i.e. it can be used to input data as well as outputting data, for example to a printer. However it now supports Fast Centronics mode and a new *Fastparallel:* device for very fast data transfer between the computer and peripherals. The serial port can now be connected to either a Microsoft or a Mouse Systems Corporation serial mouse and used in place of the standard quadrature mouse. Also, the serial port now supports faster Baud rates — up to 115 KBaud.

The video connector is a 15 pin high density D connector as with all machines since the Archimedes 540 and, as usual, a 3.5mm jack socket is provided for stereo audio output. The keyboard connector is for a PC AT compatible keyboard, unlike previous machines that have used the proprietary KART (Keyboard Asynchronous Receiver Transmitter) protocol. This means that if you don't like the keyboard that Acorn supply, then you can buy one of your choice very cheaply — very good quality keyboards are available for around £30. On the down side, this means getting used to a slightly different keyboard layout, although I'm sure that anyone who uses both Acorn machines and PCs will welcome the change. Next to the keyboard socket is a socket for a quadrature mouse — exactly the same as provided with previous machines except that it now plugs into the machine directly, not into the keyboard. There is also a reset button on the back — again this is because there is no reset button on the keyboard although Ctrl-Break continues to reset the computer.

Over the last few years it has become more and more apparent that the Acorn range has been somewhat left behind in technical terms by PC producers and the likes of Apple. This has now been put right. With the prospect of the machine doubling as a 486SX for as little as an extra £99+VAT everyone now has the option of combining the strengths of RISC OS based applications in areas such as DTP, multimedia, education and shear ease of use along with access to the very large range of software available for the DOS & Windows platform. Acorn have a machine here which I think from a technical viewpoint is going to disappoint very few people.

Mark Smith

Risc PC Graphics

John Bancroft gets rather excited by the graphics capabilities of the Risc PC

The graphics capabilities of a computer are one of the most important aspects of its function. It is this feature which allows us to read and make sense of any data that the computer is displaying. No one would argue that information displayed in a clear format is an essential requirement.

Yet the graphic presentation is not the only consideration. There needs to be an easy way to manipulate any visual information. RISC OS provides this more than adequately with the desktop GUI. When the first RISC machines were released they were well ahead of the competition. This was the case for some considerable time and only in the last few years have Acorn fallen behind the PCs with their powerful graphics cards. Some third party developers brought out graphic cards for Acorn RISC machines which gave them a new lease of life.

I bought the Computer Concepts ColourCard which satisfied me until I saw a Risc PC for the first time. This first viewing had my eyeballs coming out like stalks. The new VIDC20 chip is the display driving force behind this new superb machine. With the possibility of 256Mb of system memory and VIDC20 this platform will provide an extremely powerful graphics workstation to rival many other systems.

What can we expect from the Acorn RISC PC ? Well, the machine has been released with 3 possible graphics variants: (a) 480K DRAM (b) 1MB VRAM and (c) 2MB VRAM (upgrade only). It has the capacity for up to 16 million colours @ 800 x 600 and 1600 x 1200 Desktops in 256 colour with 2MB VRAM. Using DRAM

only you can have 1280 x 1024 4 colour desktops. It is down to the VIDC20 chip that these resolutions and number of colours are made possible. Video modes can be fully configured by the user. There is a direct relationship between resolution the number of colours. For some applications higher resolution would be more preferable than the number of colours and vice versa.

The maximum pixel rate achieved is 110 MHz and memory bandwidth into VIDC is set at least 38MB/s with DRAM only rising to 76MB/s with 1MB and 152 MB/s with 2MB VRAM. Some of the maximum resolutions that can be expected from an Acorn Risc PC are shown in the table on page five.

The modes can be configured by the user and would require a facilitating monitor. Standard modes 1280 x 1024, 1024 x768 and 800 x 600

The new mode chooser in action

are already programmed in and are compatible with the AKF85 monitor. The AKF60 monitor will handle the two lower resolutions.

What about Software? RISC OS has been updated to support VIDC20 and the new video modes. The kernel and the SpriteExtend & ColourTrans modules have been changed. A new Display Manager and Colour Picker have replaced the Palette icon of the old machines. Using the display manager, the number of

colours can be set and the possible screen resolutions is displayed according to your computer's configuration. The new colour picker works with the three standard colour models RGB, CYMK and HSV. For those of you that use Impression or Artworks, you will be familiar with the concept .

Another feature for use with the AKF60 monitor, and like monitors, is Display Power Management Signalling (DPMS). This reduces or cuts power to the monitor when the computer is being used intermittently, and is designed to shrink the size of your electricity bill and wear on the monitor.

The monitor supplied — AKF60 — is an Acorn Badged Microvitec similar to the AKF50, but with a revised frequency range and additional power save mode..

14" 0.28mm dot pitch
30 – 50 kHz
Old Acorn screen modes in letter box mode
Power save mode
MPR II

Optionally for an additional £400 ex VAT, the AKF85 can be supplied (for superb quality graphics).

17" Philips Brilliance model
0.27mm dot pitch
82 kHz Scan rate
MPR II

In conclusion, I would stress that at least 1Mb of VRAM is needed in order to do the graphics capabilities of VIDC20 any justice. Using DRAM only with this system would lead to frustration. If your budget can be stretched, the 17" AKF85 makes for a superb combination.

John Bancroft

The Risc PC in Education
Written by Nick Evans

From an educational point of view the new Risc PC is certainly very interesting. The potential for this machine is enormous, however the entry level model only comes with 2Mb of RAM and a 210Mb IDE hard disc. This will undoubtedly put some severe restrictions on its functionality, especially multitasking. Now that *Draw*, *Paint* and *Edit* have been taken out of the RISC OS roms and come on the hard disc their memory requirements will increase so that some applications such as Fireworkz will find it difficult to coexist with this minimum configuration. Naturally some video RAM or extra main memory will help to receive this problem. Another disappointment from my point of view is the inclusion of a monitor in the entry level system. Whilst it means that monitor compatibility problems should not occur the 1600 * 1200 screen modes will not be satisfactorily displayed on the smaller 14 inch monitor. Thus, increasing the RAM size inside the machine also mean that a monitor upgrade also becomes important. It may be worth considering purchasing 17 inch monitors with the original machines and forgetting about the 14 inch monitor altogether if you are going to want to use some of the very impressive higher definition screen modes. Note that Acorn are not giving new modes their own numbers because the numbers of combinations of pixels and colours are so great.

Econet and the so called "cheapernet" will be supported from the day of the launch of the Risc PC, with the faster Ethernet being supported by the end of the year.

We were assured that nearly all commercial podules produced in the past will work in these

machines but definitely not full width ones. Another limiting factor is the software with the podules because in the past the software has not expected to recognise the existence of more than three other podules, whereas now eight can be accommodated.

The casing and its greater security will be a blessing for institutions who can now prevent prying fingers from getting at the insides, especially important since all the RAM, video RAM and second processor cards can be removed in the matter of a couple of seconds.

Minor changes to the operating system are also helpful in the classroom: the applications are no longer in ROM and so *!Configure* and *!Alarm* can be removed if required. The built-in "*FSlock*" module allows the configuration of the Risc PC to be password protected, as well as allowing the hard disc to be write-protected, either partially or totally.

Nick Evans

RISC OS Changes

Simon Burrows looks at the more visible changes in RISC OS 3.50

On the surface, the changes from RISC OS version 3,10 to the new version 3.50 are not particularly major. Mark Smith looks at it from a programmer's viewpoint in the next article, so I will concentrate on the changes which affect the ordinary user.

Following on from the launch of Acorn's *!NewLook* environment last year, RISC OS 3.50 has a new appearance. First of all a new configuration option allows the ordinary system font to be replaced in the Desktop by an outline font of your choice, for example Homerton.Medium. Secondly it is now possible to give a textured appearance to the backgrounds of windows and the icon bar, as shown in the screenshot overleaf. Combined with !NewLook, which has been incorporated into the !Boot application described later, this new appearance looks very good on a multiscan monitor. The outline fonts and textured backgrounds can be turned off if so desired.
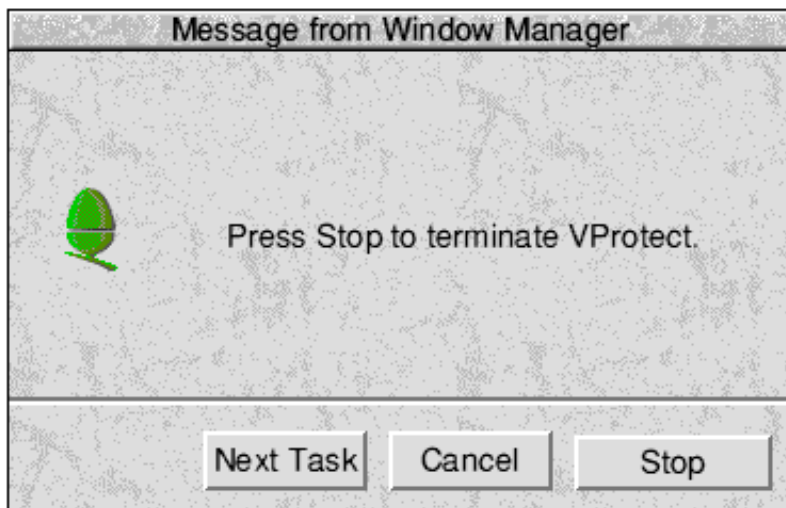
The WatchDog window

A useful new facility is called the *WatchDog*. If you hold down the ALT key and press BREAK, a window similar to that shown above is opened, which allows you to cycle through the program tasks currently running, and kill off any which you no longer want to run. The advantage of this is that if a program has gone into an "infinite loop", bringing the whole machine to a halt, this facility can allow you to regain control of the computer.

The appearance of error dialogue boxes has changed, they are now similar to the WatchDog window shown above.

Another change is that when you drag a file from one place to another in the desktop, rather than being displayed as a dotted outline while being dragged, it can be displayed as a solid icon, or rather a translucent icon, allowing you to see the desktop underneath it.
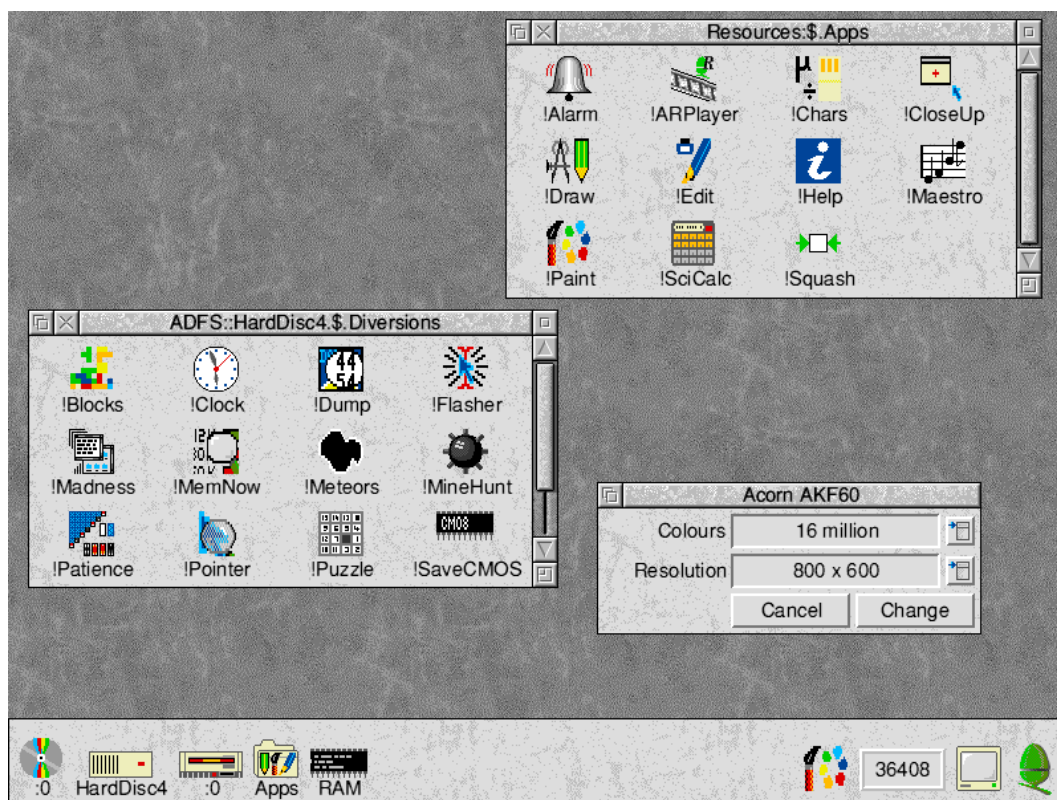
The RISC OS 3.50 desktop, note the revised applications suite

your hard disc. Double clicking on it opens up a window similar to the old *!Configure,* but also allows access to all of the other facilities mentioned. If you obtain new modules or outline fonts, these can be dropped onto the appropriate !Boot window and they will be added to your system.

FSLock is a utility built into every RISC OS 3.50 machine which allows the CMOS (battery-backed) RAM to be protected against changes, and the hard disc to be partially or totally protected against being altered using a special password which can be given to the machine. A special hardware link inside the computer can be set to prevent power-on resets being performed.

Simon Burrows

The standard Acorn applications such as *Edit*, *Paint* and *Draw* have been moved from ROM to hard disc in RISC OS 3.50, making more space in the 2Mb of ROM for the operating system. This should not be a problem since every Risc PC comes with a hard disc (upgrades will not be available for Archimedes machines). The applications are still accessed through the *Apps* icon.

Each Risc PC comes with just under 50Mb of data already included on the hard disc. This may seem a lot, and does include a number of new applications, including Acorn Replay, but also includes a large number of data files, for example 24 bit JPEG picture files, Replay files, music files and so on.
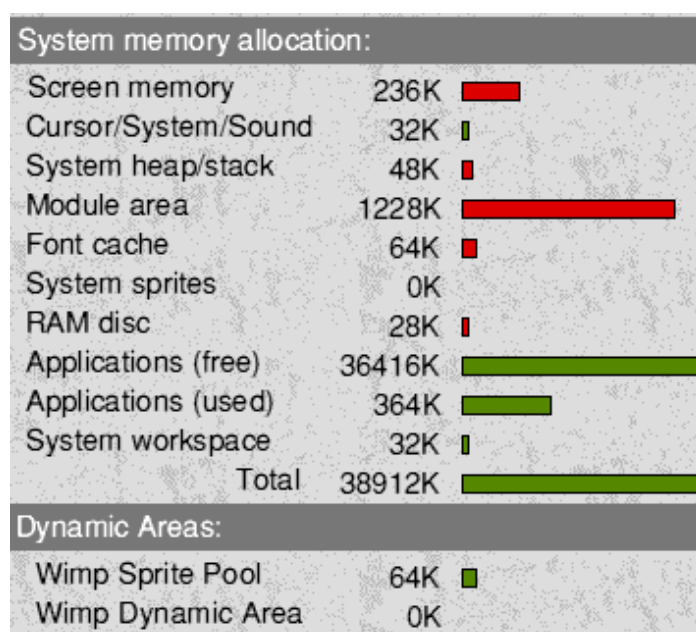
A welcome change in RISC OS 3.50 is the disappearance of *!System, !Scrap, !Fonts, !NewLook, !SysMerge, !FontMerge, !Replay, !FSLock* and *!Configure,* since all of these utilities have been incorporated into a new application called *!Boot* (original, eh?). This single application sits in the $ directory of

Part of the Task Display with Dynamic Areas

Risc PC — A Programmer's Aspect

How does the Risc PC affect the programmer? Mark Smith investigates

One of the first questions has to be "How much existing software is going to work on the new architecture?". To answer this very question, every Risc PC is supplied by Acorn with a product database called !*Products* on the hard disc, which includes information on about 800 software titles.

According to Acorn, about 75% of existing software titles work without problems, whilst a further 10% can be made to work with slight configuration changes that can be undertaken by the user. The remaining 15% will require an upgrade, where available, from the publisher. As an example of compatibility problems, Impression II does not work on Risc PC, although Impression Style does as will Publisher when it is eventually released so if you upgrade your machine and you have Impression II you will also need to upgrade that.

So what about your own programs? What is likely to cause compatibility problems and put them amongst the 15%? The main causes of trouble are as follows:

(1) Wimpslot problems — Existing machines allocate memory in 8K, 16K or 32K pages depending on the amount of memory fitted. If a block of memory is requested that is not a multiple of page size, it will be rounded up and a whole number of pages will be allocated. For example, if 36K is requested either 40K, 48K or 64K will be allocated. Supposing the application actually requires 38K. On the Archimedes range, this is no problem since at least 40K will be allocated. However on Risc PC, the page size is always 4K, so 36K is allocated and the application will fail as a result of lack of memory.

(2) Most dynamic areas have moved — This includes RAM disc, sprite area, font cache, screen memory and the relocatable module area (RMA). All except the last are no longer at fixed addresses, instead they are allocated a block within the nearly 3.5 Gb available for dynamic areas. RISC OS SWI calls must be used to locate all dynamic areas, code must not assume base addresses.

(3) Most dynamic areas cannot contain code — to retain maximum compatibility with existing programs, the ARM is almost always running in 26 bit program counter mode, that means that programs can only run in the lowest 64Mb of the address space. Since all dynamic areas (excepting RMA) are now placed above the 64Mb address boundary, they cannot contain code.

(4) Alteration of hardware vectors may not work — a new SWI call is provided (OS_ClaimProcessorVector) and this should be used in preference to altering the hardware vectors directly on machines running RISC OS 3.50 or later. Also, all hardware vectors are entered in 32 bit PC mode. This means that the status flags are not held in R15 and consequently the meaning of instructions such as MOVS PC,R14 and LDMFD R13!,{pc}^ has been altered — they can only be used to return from the hardware vector routine, not from subroutines called by it.

(5) Direct MEMC and VIDC poking will not work — this mainly applies to games. A module called "ScreenTricks" is available from Acorn which enables special screen effects to be achieved in a way that is compatible with all machines.

(6) Monitors can no longer display 15 KHz line rate modes — the AKF60 and AKF85 monitors supplied with Risc PC can only display modes such as 12 and 15 letterboxed (i.e. the display does not occupy the full height of the monitor) at a 70Hz frame rate as opposed to a 50Hz frame rate. This, again, is mainly a problem for games, causing some to run too fast or altering the points on the screen where palette changes occur.

So those are the main compatibility points. But what about writing software to take advantage of new features provided by RISC OS 3.5?

By and large, there are very few new features provided in RISC OS 3.5 other than those required to support the new hardware. From a programmers point-of-view, the most interesting points are as follows:

Dynamic areas can be created by any application or module for its own specific purposes. Dynamic areas so created may only be used for data, not code. Despite the limitations, this facility is likely to be particularly useful for modules that need large workspaces, particularly ones which frequently change in size.

For example, the WIMP creates two dynamic areas of which one is used to hold all the icon sprites. As more and more applications are seen and loaded by the filer, the WIMP icon sprite pool has to keep growing to accommodate new sprites. Versions of RISC OS for Archimedes machines use RMA to store the sprites, but they have to exist in one contiguous block within the RMA and if it can't grow where it is, then the whole block has to be moved leaving an unfilled gap every time it does so. Since the contents of the RMA cannot generally be moved around (the only way is to quit the desktop and execute a *RMTidy), these gaps can only be used if a small module is loaded or a small block of memory is claimed that can be accommodated within one of the gaps, otherwise the memory is wasted. By using a dynamic area for the WIMP sprite pool, it can grow as much as it needs to without ever having to be moved.

The preferred method of specifying screen displays is now to provide a description of the resolution, number of colours and refresh rate — there is no need to remember thousands of mode numbers for all the different displays that VIDC 20 is capable of generating. Old style mode numbers are still supported for compatibility.

There is a new sprite format for 32 thousand and 16 million colour sprites. To save space, the new sprite format uses a 1 bit per pixel mask, almost halving the size of sprites which include a mask. Sprites of up to 256 colours retain the current format for compatibility with older machines.

A new colour picker module is provided for the use of applications such as Paint and Draw that need to offer the user a choice of colours. Colours can be specified using an RGB, CMYK or HSV model and the picker is suitable for use in all screen modes from monochrome 1 bit per pixel modes right up to 16 million colour 32 bit per pixel modes.

Of particular use in a software development environment is the WIMP's watchdog facility. Pressing Alt and Break allows you to kill off any of the currently active tasks, useful if one of your applications has crashed and hung the machine. This facility is among a number of new features added to the WIMP which also include the use of outline fonts throughout the desktop and the option to have textured window and icon bar backgrounds.

PlotPlot

Review written by Tom Hughes

Plot is the latest in a long line of graph plotting packages for the Archimedes. What marks it apart from most previous efforts however is that it is aimed more at the production of graphs from mathematical formulae than the plotting of data from spreadsheets or the like — or so I thought when I began this review.

The Archimedes market has long provided a wide range of programs for turning data into graphs and charts — what has been sorely lacking however, are programs for plotting mathematical functions — to date, only one piece of commercial software that I am aware of has covered this area. When I first heard that a new program from Clares would be aimed squarely at this target, I assumed that this was all it would do, and I was a little worried when I received the package and found that it claimed to fulfil both functions, which I felt might be difficult.

The package comes in a neat box, which contains two discs (one for the program and one for the examples), and a well written 150 page spiral bound manual describing the software in

some detail. The software has to be initialised by entering your name and address before it can be used, and this process is initiated automatically the first time you open a filer window on the disc. This annoyed me somewhat, as I would have preferred it if the installation had been initiated by me running a program rather than happening automatically like this, as I like to remain in control of what's happening when I install software.

Once I had the software on my hard disc and running, I settled back to work through the examples in the manual, and see what the program could really do. Each chapter of the manual introduces a new type of graph and gives examples for you to try. All the examples are also provided on disc, which is especially useful for those where large amount of data would otherwise have to be entered!

Plot can handle a wide variety of mathematical functions, in both two and three dimensions.
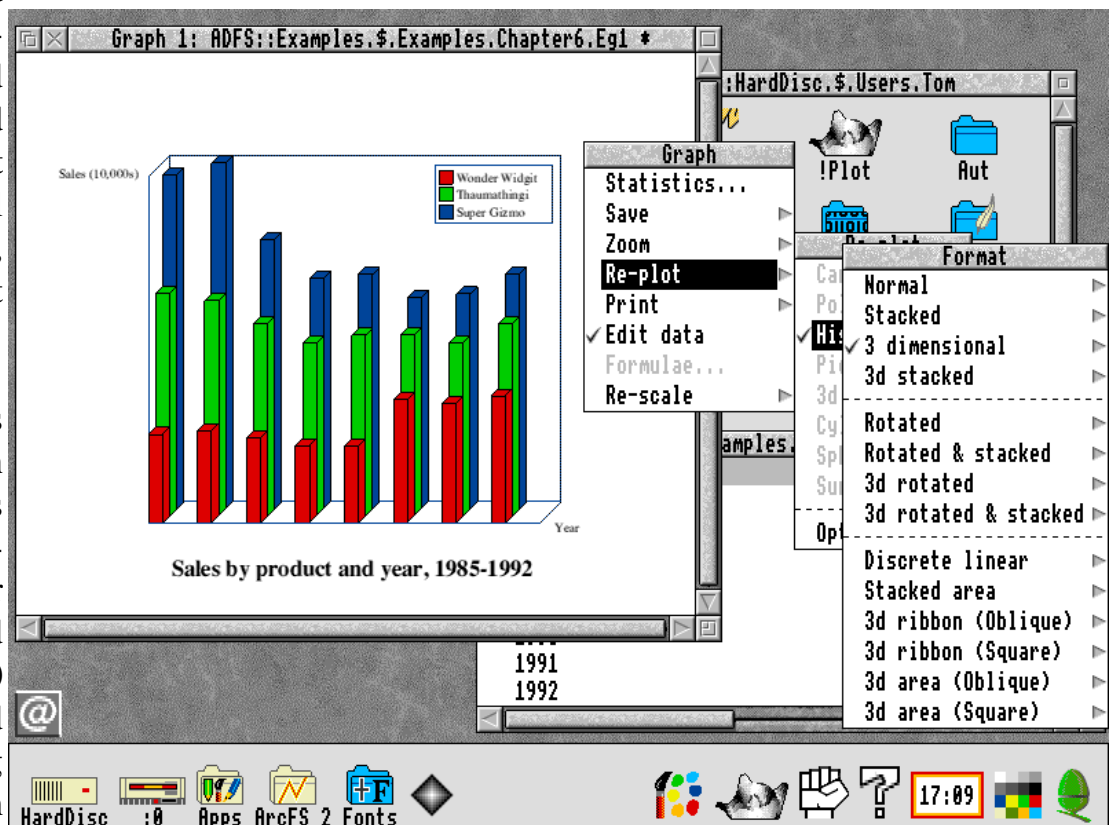
Two dimensional plots can be either cartesian or polar, and cartesian plots can be expressed in parametric notation if you wish, although this option is not available for polar plots which is perhaps a little surprising. In addition, there is a special option for generating lissajous figures, which seems (at least to me) to be something of a gimmick, as such figures can easily be generated using a parametric cartesian plot.
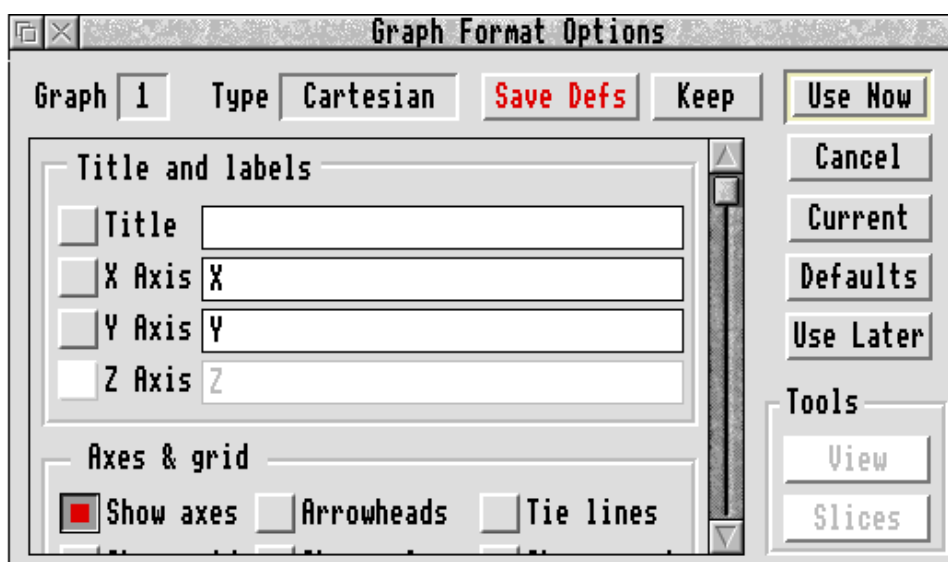
such as ternary diagrams and bubble charts.

Plot itself provides adequate, if fairly rudimentary, data input facilities which resemble a simple spreadsheet in operation. Most users would tend to import data from outside however, and the provision for this is good — data can come in CSV (Comma Separated Value), TSV (Tab Separated Value) or SID (Software Independent Data) format files and be turned into almost any sort of graph.

Once entered, data can be manipulated in many ways, and this is probably one of the most powerful and useful parts of the package: best fit lines and curves can be plotted, data can be turned into cumulative or percentage data so that cumulative or frequency graphs can be plotted.

Various options allow the graphs to be customised

Curves can be plotted in three dimensions using any of the three standard coordinate systems - cartesian, cylindrical or spherical - in all three cases, the equations have to be expressed in parametric form to allow the maximum amount of flexibility in choosing equations to plot. The final type of three dimensional plot is the surface plot which plots a surface expressed in cartesian form.

The second area catered for by Plot is the plotting of data entered directly or imported from a database or spreadsheet. Using such data, Plot can generate any of the types of line or surface plot already described in addition to histograms and pie charts (in both two and three dimensions) and several specialist type of plot

In addition to all these standard transformations which can be applied to the data, an arbitrary mathematical formula can be used to transform each data set exactly as the user wishes. All of these facilities make the software particularly suitable for analysing the results of experiments and trying to find equations which fit that data.

A menu of plot options

Once a graph has been plotted, selecting options from the menu presents the user with a dialogue box containing an enormous scrolling pane which allows just about every detail of the graph to be changed according to whim. In fact, this dialogue is probably too large and would have been better broken up into a larger number of smaller windows which allowed quicker access to just those

Z=IFF((1/R)<(0.3*Y+1.3),1/R,0.3*Y+1.3)
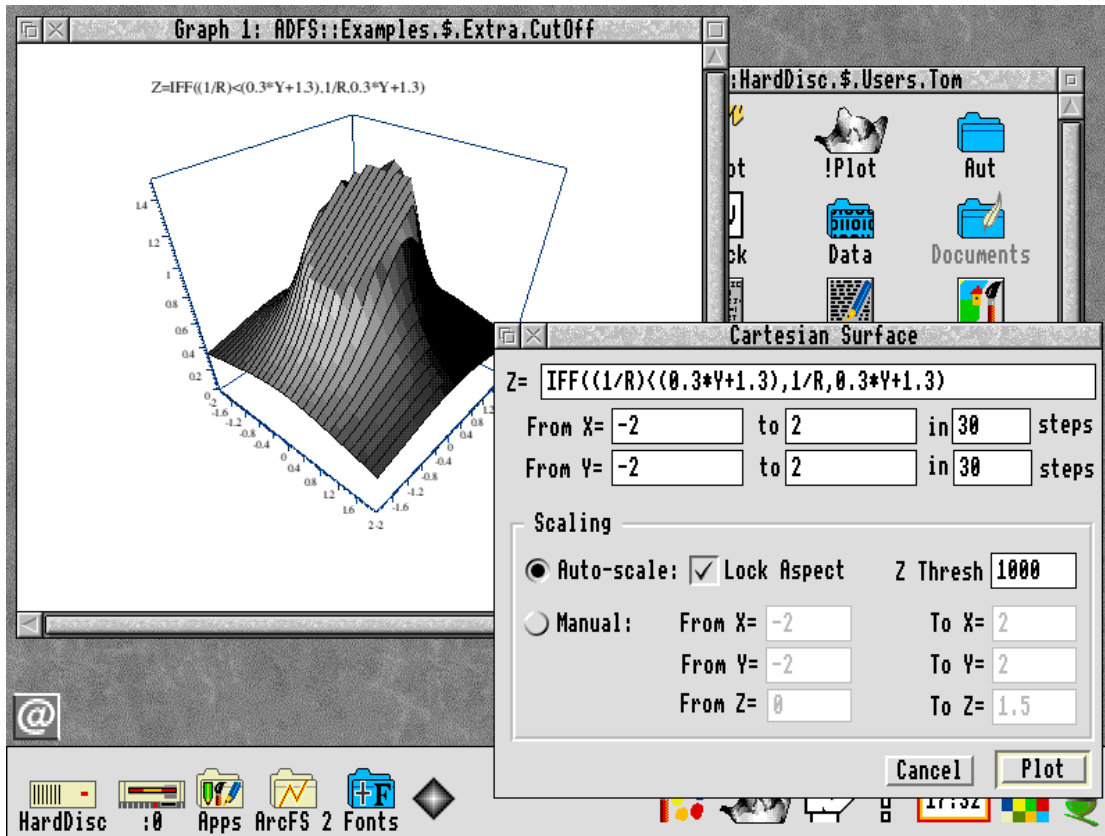
Plot allows manual and automatic scaling of axes

options which affect a particular part of the graph.

Overall, I have to say that I was impressed by this program. It certainly performs adequately for creating presentation type graphs of data, such as bar and pie charts. It also does very well when it comes to transforming data and reducing it to linear form to try and find an equation to match the data — all techniques which are important in scientific applications, for analysing experimental results.

As to the facilities for plotting mathematical formulae, these are satisfactory, but not as impressive as they could have been — there are no parametric polar plots and speed is not all it could be. The system also imposes some silly restraints on the users' input: functions such as SIN and COS have to be entered in upper case, and the system is not able cope with multiplication signs being missed out, something mathematicians like to do and which can easily be implemented in a computer

system such as this.

I am also concerned that the user interface is somewhat lacking, I particularly don't like the way in which the program "grabs" lots of function keys to act as short cuts for items on its iconbar menu. The menu structure is also a little disingenuous in places, and the options window contains far too much information.

When the program is run under RISC OS 3, it automatically uses the 3D style buttons — but they are only the same height as the 2D buttons, which makes them far too small (the text barely fits on a default action button). Small points like this are generally easy to fix, yet make all the difference to how the user perceives the software.

In summary therefore, a generally good program that could have been outstanding given a little more work on polishing up the details; hopefully time will see new versions answering some of these problems.

Tom Hughes

Plot costs £79.95 from Clares Micro Supplies or any Acorn dealer. Tom is author of the PD graph plotting package !Grapher.

So, from the user's and programmer's point-of-view there have been few changes to RISC OS. However, the fact that very much more memory, up to 256Mb, can be fitted to these machines, the vastly improved graphics facilities and the option for very fast IO with a DMA capable 32 bit IO bus, mean that these machines are very much more usable in areas such as image processing and DTP.

The facility to add another processor alongside the ARM may add a number of interesting possibilities from a programmer's view-point. For example, many people will want to buy a 486 processor card for running DOS and Windows software. However, when it is not being used to run PC software, there is no reason that it can not to be put to other uses. At the Harrogate Show Acorn plans to demonstrate a Risc PC fitted with a second ARM processor handling graphics, and there are all sorts of possibilities. (A dedicated MPEG film processor is also expected soon).

All we need now are ideas for putting the opportunities that these machines present to use.

Mark Smith

Technical Help Service

Help and advice on any Archimedes or Risc PC matter is available free of charge to Club members from the Club Office or from our stands at shows such as that in Harrogate and Acorn World '94 at which the Club will be exhibiting. Due to the number of queries which we are receiving, please put questions in writing, and send or fax them to the Club.

The ARM Education Revolution

We have been batting the idea of an education disc around for over a year now — one of us was even spotted wearing an ARM-ED Trust badge at a 1993 meeting but after two issues we ran short on energy and quality material and the scheme is currently on hold. To those who sent SAEs and £1 coins, we humbly ask patience against the day we have a really good disc to send out.

One reason we are stuck is that we do have some good but fragile programs, written as Computer Science projects at school — but the telephone time taken on solving problems when they break down has caused much stress in the original editor's family!

To disc or not to disc - that is the question.
Whether tis nobler in the drive to have
A monthly disc less nobly inter-twined
Than we would wish to see our youngsters use,
Or to take such pains against the lesser good
That we forever would our editor delay
In his great purpose of Eureka bound:
Now there's the rub that holds us speechless
And breeds such indecision in our hearts
That we would of your readership take silk,
Find governance, and hence the greater good.

One hope is to find a school or person/s of goodwill to take on the editorship of the disc. Most Club members we have spoken with feel the idea is too good to be abandoned, so it would be great to find a non-partisan editor with the special interest it takes to drum up and assemble the material.

Bruce Dickson

An Impression of Style

A look at this major new package from Computer Concepts by Geoff Stilwell

When it became necessary for me to purchase a more efficient desktop publishing program a while ago I opted for the less expensive *Ovation* from RISC Developments. Impression II, from Computer Concepts, was still well over £100. Recently Computer Concepts released their updated version of Impression Junior, calling it *Style*, and made the complete package very attractive by including their new thesaurus/ dictionary application, *WordWorks* plus *Tablemate* and *Equasor* and giving an upgrade option which made the price less than that for Ovation (more of which later).

Computer Concepts' eight page publicity pamphlet about Style, surprisingly, never mentions desktop publishing. It describes Style as "the most comprehensive word processor...". Of course Style is much more than a word processor. Impression II is considered to be the flagship of the Acorn DTP fleet and Style, although an upgrade from Impression Junior, has enhancements over this. Impression Publisher is still to be released and will be the upgraded version of Impression II containing options for the professional publisher .

My impression (if you'll excuse the pun) of Style is obviously compared with Ovation. Ovation was very easy to learn whereas coming to terms with Style was a new learning experience, probably since I had to unlearn much of the Ovation way of doing things.

Style does try to make it simple for the beginner however with a button bar which includes icon buttons giving easy access to most of the commonly used functions. These include adding text effects such as bold, underlined or italic, changing the size, typeface or the alignment of text, all at the click of a button. Rulers can be created or adjusted on screen, taking immediate effect, Use the mouse to manipulate margins and tabs with ease. This ability to interactively control the layout of text is a distinct advance on Ovation.

The cut and paste facility is most definitely another point in Style's favour. Style is intuitive in that it will, for example, work out from the area marked or selected, whether a graphics frame or an area of text, which is to be cut or copied and subsequently pasted.   Style's functions are operable from the button bar and, like most other functions, with mostly standard keyboard alternatives. An added bonus is having a 'drag & drop' facility using the mouse. This makes moving or copying text effortless.

One keyboard alternative I sorely miss with Style is the option to move about the text one word at a time. This is usually controlled with the Shift and cursor keys together. Style uses these keys for another function, that of marking text, which is similar to the way text is marked in some Windows applications. This is a trivial complaint does it tend to slow me down somewhat.

The most valuable feature of this word processor is the creation and use of text styles. Now Ovation uses styles but creating them is by using menus which did prove to be time consuming. And, one thing I never managed to
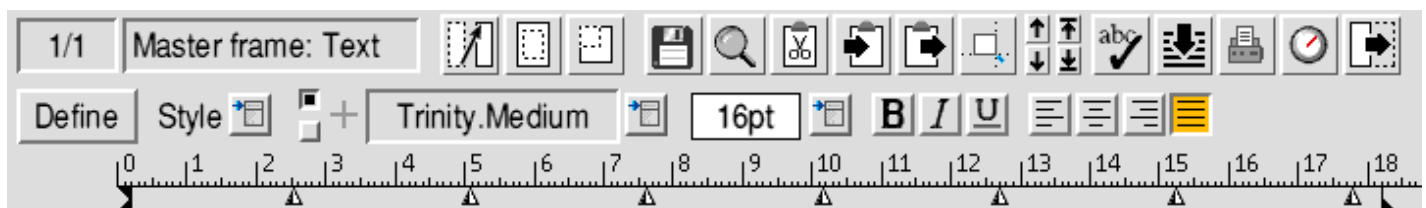
The button bar of Impression Style
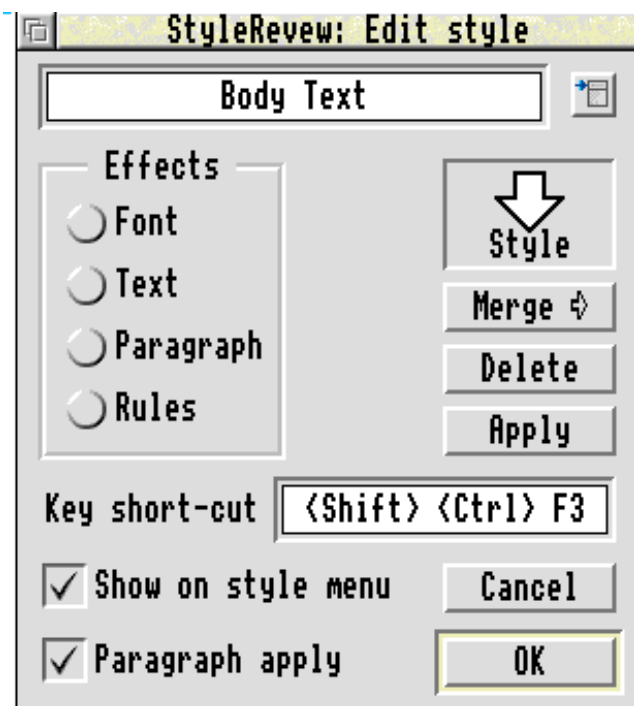
Styles were not available in Impression Jnr

platforms, and OLE compatible files (more about OLE later). Graphics can be loaded into a document by dragging them into a frame. If they are dropped over a text area a frame is created and the graphic is 'embedded' at the cursor position so that if the text is related to the graphic and is subsequently moved the graphic stays with the text.

Graphics can be moved, scaled, and rotated within a frame. Here I do miss Ovation's keyboard shortcuts to scale the graphic and fit the graphic to the frame. However it is a quick double-click on the graphic leading to a dialogue box where these things can be achieved. Also, every selected graphics frame contains a graphics tool with three handles so the graphic can be moved, scaled, and rotated with the mouse. It is a bit fiddly but again fine tuning can be achieved within the dialogue box.

fathom was how to design a ruler with different margins and tabs to go with a style. This is so much more straightforward in Impression Style.

Dialogue boxes handle every stage of the procedure and changes can be applied to the document and seen with an Adjust click on an 'Apply' button. Local effects can be 'picked up' from the page and incorporated in styles using the Define button on the button bar. A style can be as simple as different ruler margin settings indenting a section of text, or it can allow for the creation of tables with rule-offs and boxes enclosing text. I'm just waiting for the time when I write something long enough to merit the compilation of a contents page and an index using those style options.

Graphics handling in Style is excellent. It will handle graphics in several different formats. Style supports 24 bit colour (32,000 colours using built-in 'diffused dithering techniques' on an unexpanded Archimedes machine) and includes Draw files, sprites, Artworks files, TIFF images can be converted from other

Some menus from Style

OLE means Object Linking and Embedding and has been carried over from Windows applications on the PC platform. Data from other applications (mostly graphics) can be incorporated into a document and when there is a need to modify that data a Ctrl+double-click on the graphic (or whatever) will export it to its original source, for example Draw, Paint or Tablemate, where the modifications can be made. Re-saving it will return the data to Style exactly where it was, with the modifications in place. This was useful for me when I was helping a local playgroup write a letter. I used a

teddy bear graphic in a frame in each corner of the letter. After seeing the draft printout I decided that all four teddies should be facing inwards. Now flipping, or mirroring, a graphic is one thing that Style cannot do but it was simplicity itself to load up my DrawPlus application, Ctrl+double-click on a teddy which put it into a DrawPlus window, flip it, and save it back into Style facing the other way.
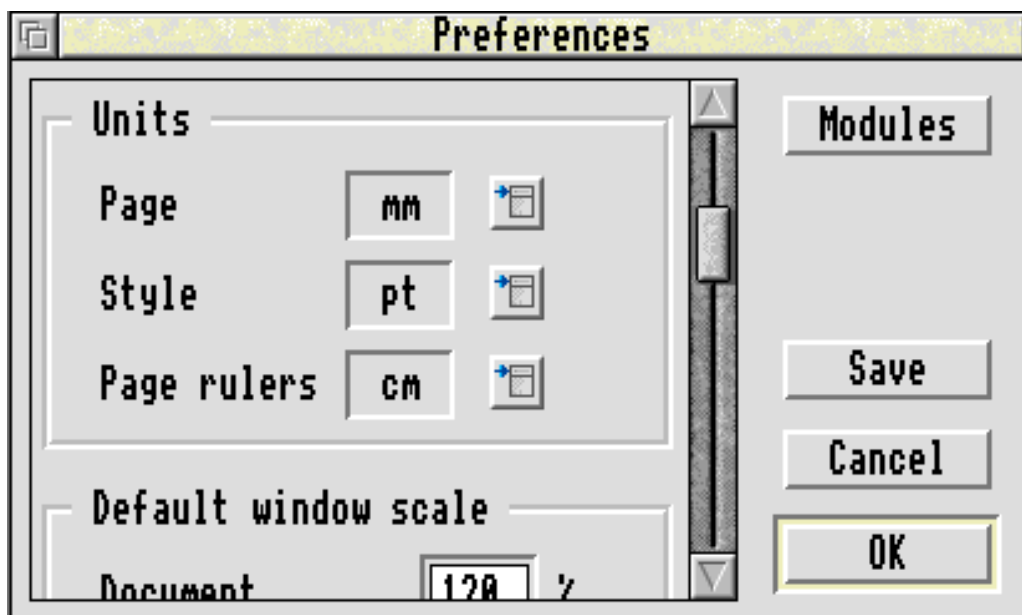
This is also one of the benefits of using Tablemate and Equasor, packaged with Style. Sophisticated tables or scientific equations can be created in the separate application and loaded into Style. Any subsequent editing is accomplished in the same way as with the teddies. [*This issue of Eureka was produced with Style, the tables using Tablemate — Ed*].

WordWorks, Computer Concepts' dictionary and thesaurus application packaged with Style, was reviewed in issue 10 of Eureka by Mark Smith so I'll be brief. It is a real aid for a flagging writer. It works interactively with Style transferring words and phrases back and forth with double-clicks of the mouse. It allows the user to scan the thesaurus for synonyms and to investigate the dictionary for meanings of words. If help is needed for any part of Style and the manual is not to be found WordWorks will supply that help. It practically makes the manual redundant.

Before I bought Style I was quite happily using Ovation. Risc Developments' DTP package is extremely effective with many excellent features. But when I read that I could 'upgrade' my unused copy of 1stWordPlus, that came packaged with the A5000 Learning Curve system I bought nearly two years ago, and purchase Impression Style for £85.78 which includes VAT and P&P I was gobsmacked. Computer Concepts are really serious when they say they want everyone using Impression for word processing. Despite the relatively minor quibbles I have nothing but praise for Impression Style. I'm sure that Impression Publisher will have everything the serious user requires, and more. Impression Style does the business for me, though, and I'm really looking forward to using it more effectively.

A frame incorporating a picture file
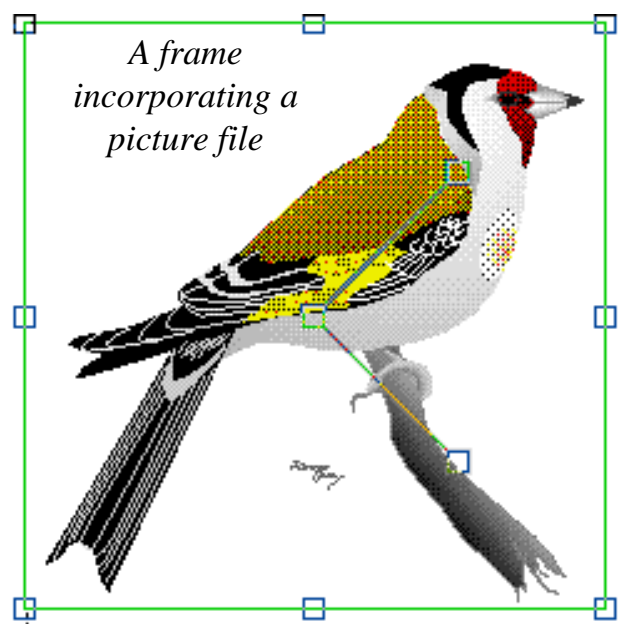
Geoff Stilwell

See Computer Concepts' adverts for full details of pricing. The upgrade from earlier versions of Impression to Style is exceptionally good value priced at only £29.00 + VAT.

Easy Font

Peter Jennings looks at a quick way to sort out your fonts and add some new styles

With Easy Font, a font management system from Fabis Computing, you get two useful utilities for the price of one (£29.38, including VAT). In addition, current advertisements are offering an extra bonus with the choice of a free disc of fonts normally costing £17.63 with every purchase.

The first function of the program, which requires a hard drive and RISC OS 3.1 or greater, is to allow you to store all your collection of fonts in a single directory and choose a selection to be installed in any application, such as a word processor or desktop publishing program, simply by clicking in a window. This is useful enough but you also get the ability to add new weights and styles, such as condensed, expanded, oblique, slanted and uneven, also at the click of a mouse button.

Easy Font comes on a single, unprotected but numbered, disc with a 23-page notebook sized manual, all packed into a neat plastic case shaped like a miniature video cassette box. The manual is well illustrated and describes everything fully and in simple

terms. Setting up is very easy. The program is copied into the root directory of your hard disc and, when run, it puts its icon on the icon bar. All your fonts are loaded into it by dragging them onto the icon bar icon and this has to be done only once. Everything else is then controlled by clicking in windows.

The main window displays an alphabetical list of all loaded fonts, including the three already in ROM. Clicking menu on any entry shows its weights and styles.

Any fonts you wish to use in a particular application can be installed in it by clicking
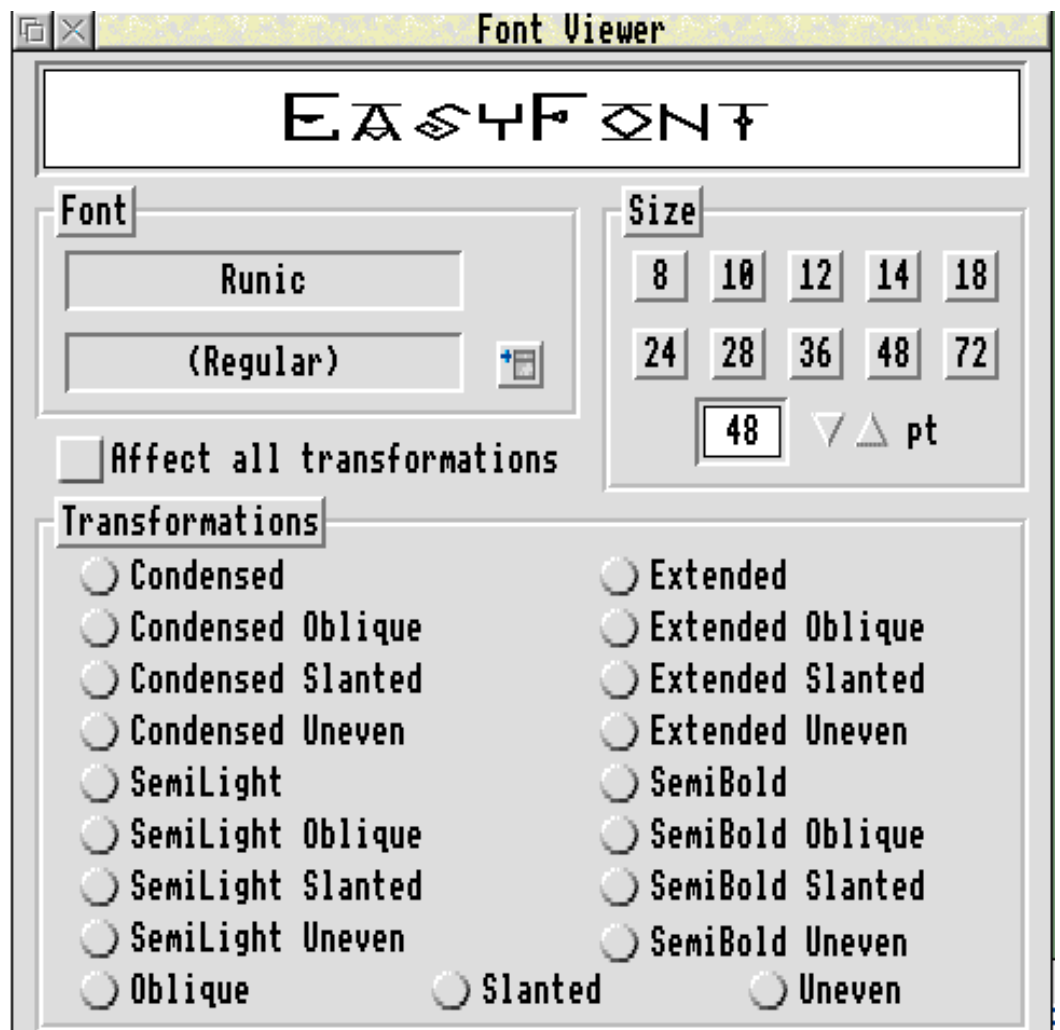
ARNOLD'S OBSERVATIONS

Steve Arnold admits to being only human..

It's that time again! Article time. Just when you think that your world is on an even keel, some bright spark comes along and scuppers you. Someone who reminds you of your responsibilities, like writing your next article for Eureka Magazine. Yes Mr. Editor, you know who you are, always the pressure to meet those deadlines – hey, have you ever thought why they call them "Deadlines"? Yes you've got it! – you're dead if you don't get them lines done in time.

Well, at least I'm consistent, consistently late; I keep promising to get my articles completed earlier, but as always, somehow manage to convince myself that there's plenty of time and put them off until the very last minute (or until the Editor screams loud enough to cause me pain! – only kidding). He's a good sort though, always got a nice few words for me when I send him my stuff, and lots of rude words when I don't. Still it shows I'm only human, and as if that is not enough to convince you of my fallibility, read on...

A Depressing Little Story

Things have taken a turn for the worse recently, I've been talking to my computer, the wife thinks I'm one short of a full load – you see, I've fallen foul on not taking my own advice. There I was busy working during the wee hours of the morning on a presentation document. I was feeling very happy with my nocturnal endeavours and decided to finally give in to my desires for sleep. So I saved my masterpiece onto my working floppy disc and was about to switch off, when I remembered that I'd better take a back-up of it just in case something silly happened. The trouble was, something very

silly had already happened. After saving the document I deleted the file from my computer's memory. Yes you've guessed it – as I tried to copy the document, from the floppy to my hard disc, I received that wonderful message that most of you will be familiar with: "Disc Error at location: xxxx" That's when I started to verbally address my computer in Basil Fawlty mode, threatening to
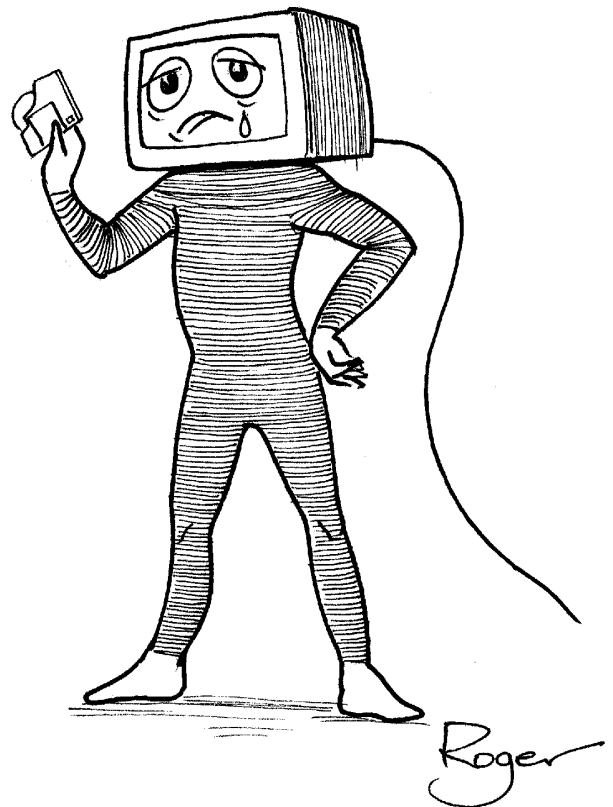
Remember what an idiot Arnold was..!

break its ARMs (sorry, that's awful!) and shove them up its ports. In this ranting state I woke the wife; she considers my actions as those of some demented idiot. I told her that I was none too happy. She just turned over and went back to sleep, mumbling something about ".. seeking medical attention". I could only reply with a very muted grunt. Deciding not to

let this get the better of me I attempt with only limited success to recover the document. Two hours later I had recreated the document from the fragments I had recovered. This had taught me another valuable lesson about backing up data. Never destroy the master data, even if it's the one in memory, until you have at least two copies on different media. I'm not so smug now, it's an easy trap to fall into – but it hurts when you get caught by it. It cost me several things;

Loss/Effects due to disc error:

• Material – 1 Floppy Disc.

• Time – 2 extra hours of work and 2 hours loss of sleep.

• Money – 2 hours electricity for the computer.

• Stress – I have a wife who keeps on checking to see whether there are hairs growing on the palms of my hands or whether my eyebrows are starting to join together.

• Most of all a loss of pride and confidence.

So Be Warned.

Anyway enough of this sad tale. If you have had a similar fate or wish to tell us of some computer associated exploit, write and share your experiences with us. Think of it as Therapy.

I have been asked who's the wonderful graphic artist that creates my little pictures. Well he's a colleague of mine and kindly produces these little masterpieces based on a one minute discussion of what I want "Computer Man" to do. His name's Roger –

as if you hadn't already guessed – and I'd like to take this opportunity to thank him for all his efforts so far. Time for me to close once again.

I'll leave you with this thought;

"*At their most basic level, computers are just a load of noughts and ones!*"

Happy Computing — Have Fun!

The Eureka Magazine Disc

There's not much space to talk about this month's Eureka Magazine disc, but fortunately most of it is self-explanatory.

Image, from Club member Ian Palmer, is a 24bit image processing package for RISC OS, running under versions 3.1 onwards. It provides the user with a multitude of processing tools as well as reading several different file formats. This program is shareware and is of a very high quality.

Also included is the WimpExt module which is needed by Magniscop from the last issue. I apologise for not including this but I have the module in my !System folder and didn't realise that the program asked for it.

The catalogue program has been improved slightly, although you will still need an Epson compatible printer to print out a list of requirements. The slow speed of loading the various text files has been slightly improved, although running the program from a ram disc helps considerably. Please remember to return faulty discs (i.e. those with verify errors) to the Club address so that they may be replaced.

Nick Evans, Disc Editor

PDSview

John Bancroft has his head in the stars (or rather the planets)..

This updated offering from Spacetech is a general purpose tool kit for image processing. The package aims "*to provide optimum conditions for viewing and comprehending digital images from as wide a range of sources as possible.*" And the sky is literally the limit.. A Planetary Data System (PDS) developed by none other than NASA, allows a standard method of access to the wealth of image data collected by their spacecraft. However, it also has more down to earth applications. It could be a useful tool in the differing fields of medicine, crime detection or scientific research. For the home user, any humble scanned image or grabbed video picture may be dramatically enhanced.

The package is available from Spacetech, 21, West Wools, Portland, Dorset DT5 2EA. Tel: 0305 822753. It contains a program disc, with two support discs and a 154 page A5 manual in a sturdy ring file. As it is a highly sophisticated piece of software, consideration has to be made for the average user. A blue insert, tucked inside the sleeve helpfully states "*Don't panic!..*" and the manual goes on to explain a three stage tutorial system for the beginner. Wherever possible, analogies have been drawn from the photographic world, which shares many of the principles of image processing.

The program has true 24 bit colour capability including 24 bit colour separation of any sprite or clear file. PDSview is fully RISC OS 3 compliant and requires a minimum of 2 Mb of memory (4 Mb is more practical) and a hard disc. A graphics card or Risc PC is also highly recommended. PDSview can import and export standard Sprite, JPEG, CLEAR, Data and Text files. A unique feature is a facility for handling WX-Task files, which are weather satellite images gathered by Spacetech's Weather Desk application. It also supports CSV (comma separated variables) files, used to export and import histograms relating to image data. The TIFF format is not supported at present. Data image files of various formats are used on the PDS CD ROMs and are recognised by their file extensions. If PDSview is presented a Data file with no extension, it will look for header data at the start of the file. Otherwise, format information can be entered via the raw data box from the load menu. eg. the horizontal pixel length of the image is entered.

There are nine processes available to refine images:

Normalisation ensures that any given scene makes full use of the dynamic range available,
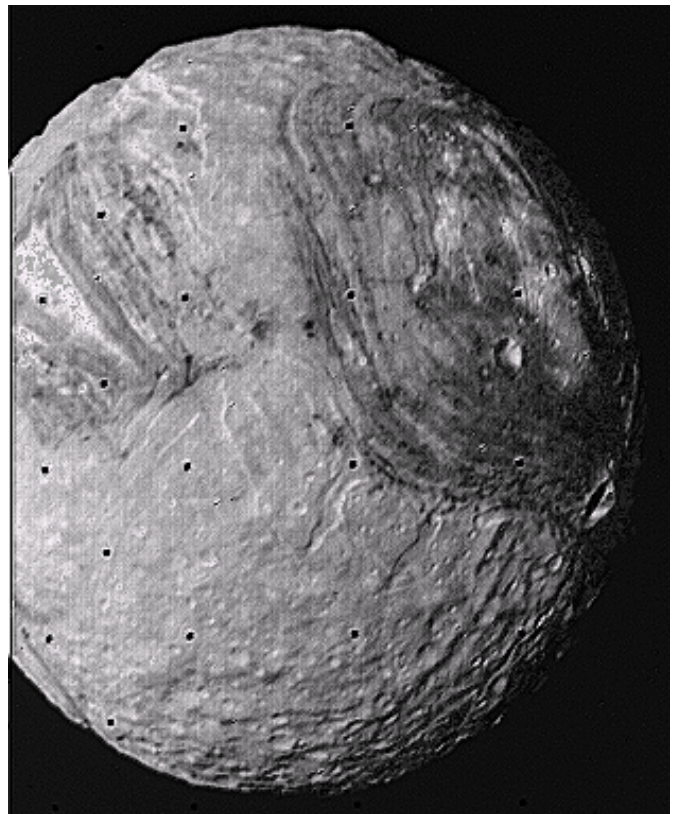
An enhanced image of Miranda, one of the moons of Uranus

by maximising the contrast of the image.

```
┌─────────────────────────┐
│ Primary band            │
├─────────────────────────┤
│ Info              ⇨     │
│ Cursor            ⇨     │
│ Save              ⇨     │
│ Magnify           ⇨     │
├─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─┤
│ RGB bands         ⇨     │
│ Reproduction      ⇨   ┌─────────────────────┐
│ Process           ⇨   │ Process             │
│ Geometry          ⇨   ├─────────────────────┤
└───────────────────────┤ Normalise      ⇨    │
                        │ Arithmetic     ⇨    │
                        │ Binary         ⇨    │
                        │ Correlation    ⇨    │
                        ├─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─┤
                        │ Unsharp mask   ⇨    │
                        │ Convolution    ⇨    │
                        │ Adaptive Eq    ⇨    │
                        │ Median         ⇨    │
                        │ 3D Project     ⇨    │
                        │ Undo option         │
                        └─────────────────────┘
```
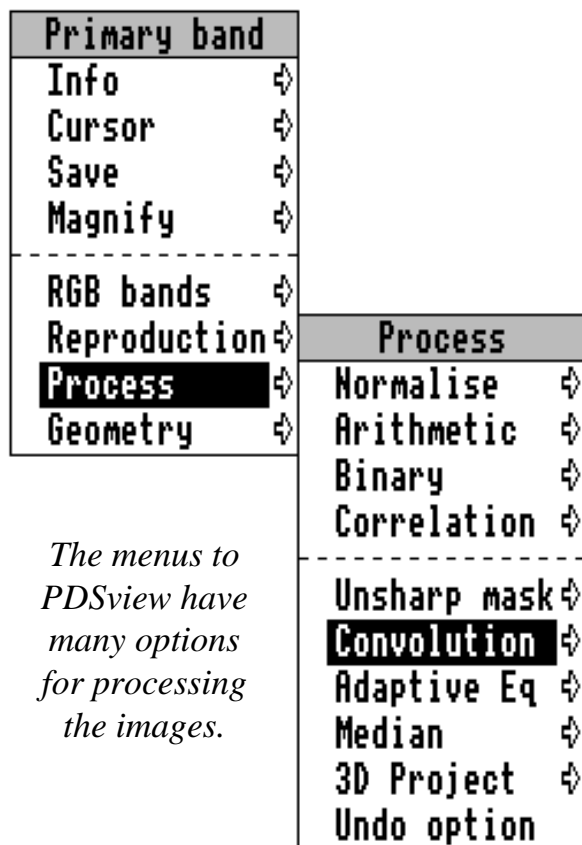
The menus to PDSview have many options for processing the images.

Arithmetic allows the image data to be manipulated by simple arithmetic operations. These can result in control over contrast and brightness, and can also be used to merge or mask images for a variety of photographic effects.

Binary allows standard logical operations to be performed on the image data. This includes pixel replacement on a magnitude basis, allowing images to be mixed together.

Correlation provides facilities for image comparison and can be used to classify regions of similar intensity.

Unsharp mask averages the image over a programmable area. The

results of this process can then be used as a mask for a variety of further operations including selective contrast enhancement (unsharp masking).

Convolution allows a number of differing filters to be applied e.g. for sharpening or softening the image.

Adaptive equalisation provides a highly effective process for exposing details obscured in the image data. If detail is present, then this process is guaranteed to reveal it.

Median is a statistical filtering technique ideally suited to noise removal. It can also be used to grow or shrink image detail.

3D Project makes images appear three dimensional. Suitable images will typically come from weather satellites showing cloud coverage or radar mappers where the image data values represent altitude.

PDSview loads bit images into two main areas, called the Primary and Secondary bands, with associated displays. The primary band shows the complete image in its window and it is where all image processing is performed. Some images will be loaded into the Primary band from where they are viewed via a palette, (if
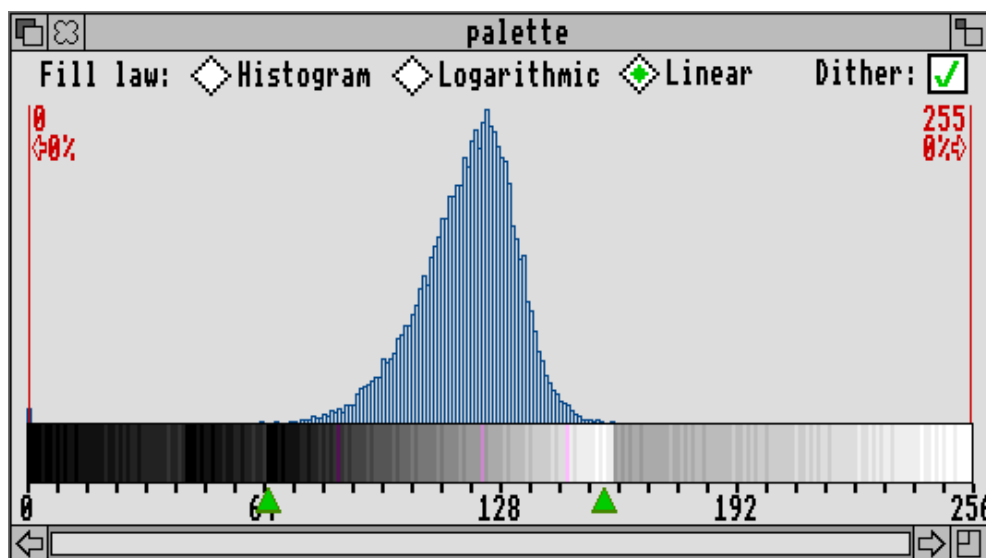
The Histogram window showing the distribution of colours

one is loaded with the image), or via a default palette of grey levels. The menu which opens up over this window gives access to all the various image processing tools.

From here, Secondary bands can be opened up to allow multiple images of the same dimensions to be combined to form a colour composite, with each Secondary band contributing to one of the red, green or blue components. Images held in the Secondary bands can be seen in a mini-viewer, which always shows them in simple grey-levels.

In addition to the image windows, a Labels window displays any text which came with the image. A palette window is also available and contains a histogram, showing the number of occurrences of each colour against the possible range of colours from 0 to 255. Below the histogram is a colour wedge showing the available colours as a virtually continuous spectrum. Dragging out a box over any part of the primary image causes the histogram for the area to be displayed.

If sufficient memory is available an interpolated zoom and image re-scaling command can be used for pixel free blow-ups. This put simply, retains the sharpness of the image as much as possible, while hiding the original pixel positions.

The review copy of PDSview was accompanied by 2 NASA CD-ROMS containing hundreds of images from various space crafts, such as the Voyager missions and Meteosat weather satellites. Spacetech are now able to supply raw spacecraft image data on CD-ROM for subsequent processing, enhancement and analysis. As a young boy I would spend many cold hours looking through my telescope studying the universe. Now thanks to NASA, Spacetech and my A5000 I can wander through the planets in great detail.

At present, there are four CD-ROM packages available.

SPOT compilation : A CD-ROM containing 50 images from the French SPOT land mapping satellite. Some of these scenes are full-size (60km square) and down to 10 metre resolution. Others are sub-scenes, carefully selected for their geographical interest and relevance to the geography syllabus. Both panchromatic and multi-spectral images are included. Because some of the images are very large (in excess of 50Mb) an application called **PDSmap**, to simplify the extraction of full resolution image data, or to view the whole image in reduced resolution, is included for PDSviewer users. The set covers the following features and land uses: Environmental, settlement patterns, urban development, agriculture, rural, geology, ocean, urbanisation, civil engineering, hydrology, deforestation, oceanography, ice flows, structural.
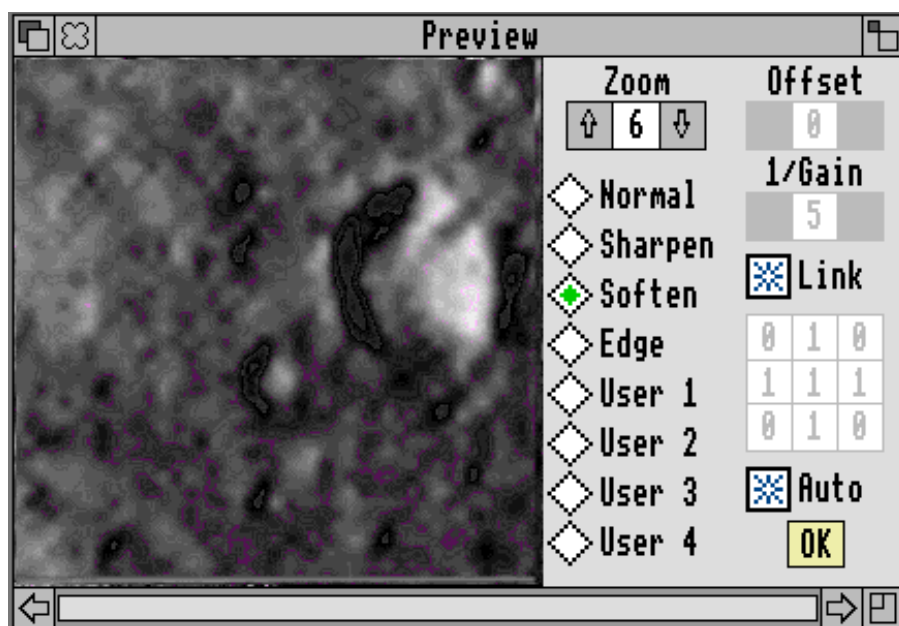
Zoom in without the pixels becoming obvious

Space Science Sampler : 2 discs containing 800 pictures of Uranus, its rings and satellites and 400 files of other space and earth science data including images from Voyager, Landsat, NOAA, Pioneer, Magellan, Seasat, and Viking.

Voyager Spacecraft to the Outer Planets : 12 CD-ROMS containing over 26,000 compressed images from Voyagers 1&2 of Uranus, Saturn, Jupiter and Neptune, their rings and moons.

This is a highly sophisticated image processing package, with an extremely well written manual enabling the user to get the best use of the program. I have been assured by Spacetech that PDSview will work on the new Risc PC from Acorn. The greater memory capacity and considerably higher resolution displays of this new machine, will maximise all the myriad resources that this package has to offer. PDSview deserves to be on any serious graphic user's "want list". So far I have only scratched the surface of what this package can do and no doubt will come back to give further information on what this software can achieve. The price reflects the quality. The basic price is £116.19, with a site licence of £176.25, including VAT. An upgrade from an earlier version includes a new manual for £17.62. Spacetech are also offering packages to Educational Users at reduced prices, and discounts are available to Club members on request. If your work or hobby involves computer image enhancement, this technology is well worth the investment.

Reviewed by John Bancroft.

John is the Club's resident graphics enthusiast, and was recently elected as Club Treasurer.

All Change at the Bottom

Following the Club AGM in December two reluctant heroes, Ralph Sillett and Geoff Stilwell, were coerced (or elected) onto the Committee and Mick Cooper left us.

At the next meeting of the Committee in February, Mark Watts resigned from the Committee due to pressure of work and elections were held for Club officers. Consequently the following people have been mated to the posts listed below. Our thanks go to Mark and Mick for all their efforts.

Acting Chairman — Steve Arnold
Vice Chairman — Bruce Dickson
Secretary — Geoff Stilwell
Membership Secretary — Ralph Sillett
Treasurer — John Bancroft
Public Relations — Andi Flower
Products Development — Mark Smith
Magazine Editor — Simon Burrows
Nick Evans also remains on the Committee as doughnut supplier for meetings.

The major change as a result of the elections is that the Club telephone number has changed to 071 624 9918 but the Club fax number remains at 081 446 3020. The Secretary's number is really for administrative enquiries rather than technical questions, and should only be used for this purpose in an emergency. Due to the number of technical questions which we have been receiving by telephone, we must ask that you put them in writing. A recommended alternative is to look at the Members' Interests list and contact another member who may be able to help. The Club Secretaries have, in the past, been chosen for their administrative inabilities and not for their general knowledge.

Nick Evans

Easy C Review

The latest program development environment from RISC Developments
reviewed by Tim Browse

Introduction

Easy C from *Risc Developments* is described as an "Easy-to-use C Development System". Priced at less than £50, it is certainly the cheapest commercial C compiler available for Acorn RISC machines.

There are currently two other alternatives available to anyone wishing to program in C on RISC OS machines: *Acorn Desktop C* (hereafter referred to as Acorn C), which costs £200, and *GNU C/C++*, which is produced by the Free Software Foundation, and is, not surprisingly, free.

In this review, I will attempt to concentrate on Easy C as it would be perceived by an inexperienced or novice C programmer — this seems to be RISC Developments target market. However, there may be people who want to do serious work with C, and are trying to decide between Easy C and Acorn C, so I will occasionally take a more technical standpoint. As I see it, with this target audience in mind, there are a number of factors to consider in this review. I will address these in what I consider their order of importance, with the most important being dealt with first. During the course of this review, I compiled a number of simple C programs, some compiler benchmarks (special C programs designed to test the performance of the compiler), and a reasonably large desktop application which I have written. The latter was used to test the claims that the system is capable of handling "*very substantial programs*".

Before I start, I should explain that Easy C consists of a relocatable module which contains the compiler, assembler, linker and librarian, and a desktop front-end, which provides an easy-to-use way of driving this module.

Documentation

The Easy C manual is a fairly hefty 200 pages. It starts with a good overview of what C is and why you'd want to use it rather than BASIC or assembly language. It covers the differences between interpreted and compiled languages, and explains what high-level languages are. It puts forward the conventional wisdom that high-level languages are preferable to assembler: "*...you are best off leaving Assembler for the few cases where it is essential, such as writing fast routines for handling hardware interrupts*". Strange, then, that the Easy C module proudly claims to be written in "*hand-crafted*" ARM code — a case of the author not practising what he preaches?

The concept of libraries and linking is quite well presented, although it tends to use words such as 'declaration', without explaining what is meant in technical terms. This may be confusing to the novice C programmer, whose everyday understanding of the word may seem to make little sense in the context of a compiler.

After the introduction, the manual launches into a description of Easy C, how to install it (installation is extremely simple), and gives worked examples of how to compile, link, and run simple C programs using the desktop front-end. Following this section is easy, and furnishes the user with a good understanding of how to use the front-end.

The make facility (a reliable way of building projects consisting of more than one source

file) is described well — it is a simple procedure to set up Easy C to generate a makefile. The actual syntax of the resulting makefile is, however, very poorly documented — presumably RISC Developments don't think any Easy C users will ever need to edit a makefile (I think they're wrong).
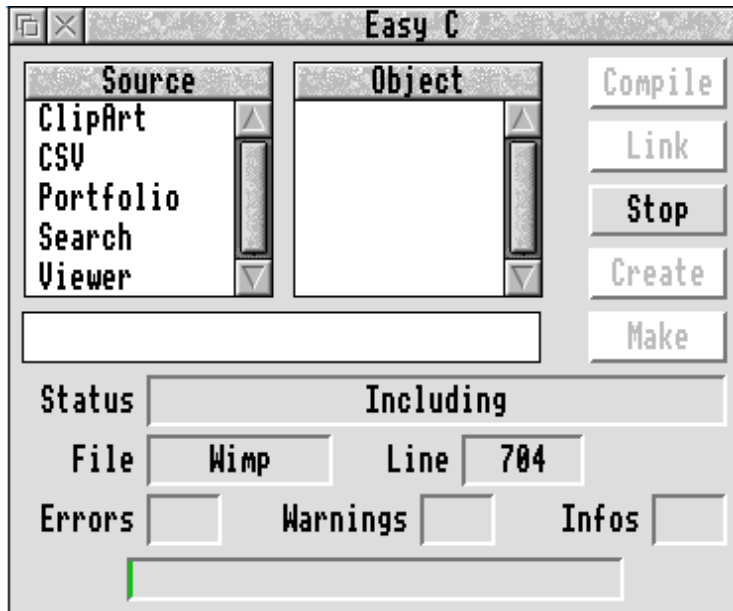
The manual contains a fairly lengthy tutorial, which does a pretty good job of providing the newcomer to C with enough information for them to be able to start experimenting. It explains in an informal way important concepts such as types, control constructs, structures, pointers, and also highlights some of the important differences between C and BASIC. I would have liked to have seen more examples of common C programming errors, and perhaps examples of programs that contain bugs (yes, such things do exist). One trend I didn't like and didn't expect to see in a modern C tutorial, was the use of various C idioms that have given C a bad name. For example, most experienced C programmers I know who care about readability and maintainability, would have looked askance at the following fragment found in the Easy C tutorial:

```
while (n >= 0)
 *(str + n--) = (char) fgetc(in);
```

In some places the tutorial is haphazard, but it's far better than nothing, which is the tutorial you get if you buy Acorn C. It's also worth noting that most tutorial books on C (one of which the novice user of Easy C would need to purchase fairly soon) cost almost half as much as this package does.

In general, while the content is good, the layout of the tutorial is poor — it follows the form of a program listing, and then a series of rather dense paragraphs explaining line by line how the program works. It felt a bit claustrophobic to me — and I've been programming in C for over five years.

The manual ends with a large but competent description of the standard ANSI function library and the supplied (but now obsolescent) ROSLib functions. The ANSI section should prove good enough for the intermediate/novice C programmer for a long while, even if the English used is sometimes slightly unclear.

Code Correctness, Size and Speed

The issue of code correctness often surprises people new to compilers. On first contact with a compiler, many people, myself included, assume that the compiler will always produce correct code. However, a compiler is like any other computer program, and may (read "will") contain bugs. In compiling my desktop application, I found a number of problems which were not apparent when it was compiled using Acorn C. One particularly serious error I found was that in one (and possibly more) of my source files, access to static data was incorrect, causing almost all the code in the file to fail to work correctly. On contacting the author, he told me that this problem has been fixed in the latest version. Code correctness is of paramount importance (much more important than code size or speed) in a system designed for beginners. The last thing a

beginner wants to do is spend an hour tracking down a bug (as I did), only to find that it is a bug in the compiler (as I did). I found other evidence of problems in the generated code; quite a few of the operations I tried in my application resulted in incorrect behaviour.

It may be unfair to compare the size and speed of machine code generated by Easy C to that of Acorn C (or GNU C/C++). However, some people may consider buying Easy C instead of Acorn C for commercial purposes, so I conducted a few tests (the results are shown in the tables below). The classic Dhrystone benchmark is a clear winner for Acorn C — it's roughly twice as fast as Easy C. The Sieve of Erastosthenes benchmark was interesting (timings are in seconds) — Easy C was faster than Norcroft. On examining the assembly language code I noticed that Easy C seemed to be using a sneaky optimisation tailored to improving performance for this benchmark. I factored this out by changing the source, and this is the time shown below (the original sieve timing for Easy C is shown in brackets). Of course, the author of Easy C would probably argue that Acorn C uses some sneaky optimisations to improve Dhrystone performance, and he may well be right.

	Easy C	Acorn C
Dhystones per second	6313	12690
Sieve of Erastosthenes	13(11)	13

I also ran some other fairly standard benchmarks, and the results are shown below.

	Easy C	Acorn C
integer	0.18	0.14
short	0.18	0.20
multiply	0.67	0.67
function call	0.44	0.43
double	9.61	8.11

These give the performance of various common C operations. The timings are in seconds. The reason that the 'short' operation is slower on Acorn C is because it uses 16 bit 'shorts' which the ARM is not very efficient at processing, whereas Easy C uses 32 bit shorts, which are simpler for the ARM to handle. (Both interpretations fall within the ANSI C standard.)

I then ran some tests using code of my own. The timings, in seconds, are shown in the table below. The Test1, Test2, and Test3 programs are simple programs to test structure access, integer and floating point operations, and common sub-expression elimination. Test2 is a version of Test1 which attempts to avoid Acorn C's aggressive constant folding and data flow analysis, which was given a slightly easy target with Test1. Test3 is simply a version of Test2 with the floating point tests removed. The reader is left to draw their own conclusions.

However, all these benchmarks are no substitute for running "real-world" code. To do this, I recompiled specific parts of my desktop application with both Easy C and Acorn C, and timed the results (also shown below, in seconds). The 'Validate' test is an internal function which the application uses to validate its internal structures, and is a good example of the sort of code that would normally be executed in a real world program (it was repeated 100 times to get an accurate timing).

	Easy C	Acorn C
Test1	21	9
Test2	21	15
Test3	30	28
Validate	6.63	5.39
Load	15.00 (?)	15.06 (2.61)
Save	13.69 (1.54)	12.17 (1.44)

The Load and Save tests are tests for loading and saving a large file. For these two tests, the first number is the test using a hard disk, and the number in brackets is the test using a RAM

disk, to try to factor out the I/O times. I couldn't get a timing for loading from RAM disk for Easy C, because when I tried it, it caused an address exception in my code. Due to the nature of this error, I couldn't say whether the error is in my code or the code generated by Easy C (and I didn't have time to track it down).

Code size is slightly inferior to Acorn C. It's difficult to tell from object file sizes the real difference in code size but on average, Easy C's code seemed to be about 5% to 10% bigger than the equivalent code from Acorn C. Comparing the assembly language output of both compilers shows some slightly naïve code generation from Easy C, missing a few of the most common code optimisations, such as removing redundant loads/stores, and sometimes it didn't seem to make the most of using register variables either.

Reliability

Sadly, I found Easy C to be less than reliable. On small programs it seemed to work fine, but larger source files seemed to cause it problems. I found myself rebooting an awful lot during the course of this review. Also, the desktop front-end had a habit of dying, leaving the compiler module in an unknown state, and the module had to be RMKill'ed before any more compilation could be done.

While compiling one of my files, it claimed to have run out of memory, when the Task display showed that there was about 700k free. After acknowledging this message, compilation continued (don't ask me why), and trying to compile anything subsequently caused an address exception. The author says he is aware of problems with memory management within the compiler, and hopes to improve this in a future version.

I tried doing a clean boot to ascertain if I had any modules loaded which were causing it problems - if anything, Easy C became less reliable. I made the mistake of trying to 'make' my application before having 'seen' the DeskLib directory with the Filer. Easy C complained that it couldn't find a DeskLib header file, and then promptly died with another internal error message.

I encountered a number of warnings that I considered to be just plain wrong — for example, it warned me that a static variable which had initialiser may be used before being initialised(!). It also seemed to 'forget' about functions defined earlier in the same file, and complain that it hadn't seen a prototype for them when it clearly had. This is annoying because warnings are useful — any experienced C programmer will leave on as many warnings as he can to catch bugs early. The number of incorrect warnings I received might make a novice user get fed up and turn off the warnings. Luckily though, Easy C provides a number of warning levels, so you can set this to be a compromise between being useful whilst not being too annoying.

The compiler seems unable to handle nested #defines - this is quite serious, because they are often found in C programs, and are very useful. I am very surprised that the author hasn't already spotted this problem. On contacting the author, he said he was also surprised that this didn't work (as Easy C uses the standard ANSI algorithm for macro substitution), and would be looking into it.

Ease of Use

The desktop front-end is very easy to use. It provides the user with a simple way of compiling C programs with the minimum of fuss. The automatic make facility is also useful. However, against this I would have to say that for similar tasks, Acorn C is just as easy to

```
┌─────────────────────────────────────────────────────────────────┐
│ ▣              Easy C advanced setup                             │
│ ☑ Report Warnings    ☑ Report Informationals                    │
│    Include path [                                              ] │
│       #define   [                                              ] │
│    Error limit [ 20 ]  Base [ 8000 ]  Image file [            ] │
│    ┌──┐Create listing──────────────────────────────────────┐    │
│    │  │  ☑ Source  ☑ Variables  │ Includes  │ Code  │ Expanded   │
│    └──────────────────────────────────────────────────────┘    │
│  ┌─Files generated──────────┐  ┌─Optimisation─────────────┐     │
│  │ ☑ Object ☑ Image │ Debug │  │ ☑ Peephole  ☑ Fold       │     │
│  └──────────────────────────┘  └──────────────────────────┘     │
│  ┌─Profiling────────────────┐   Standard [   ANSI      ]▣        │
│  │ │Function   │Line         │   Warning lvl [6 - Portable]▣     │
│  └──────────────────────────┘        [ Cancel ] [ OK ]          │
└─────────────────────────────────────────────────────────────────┘
```
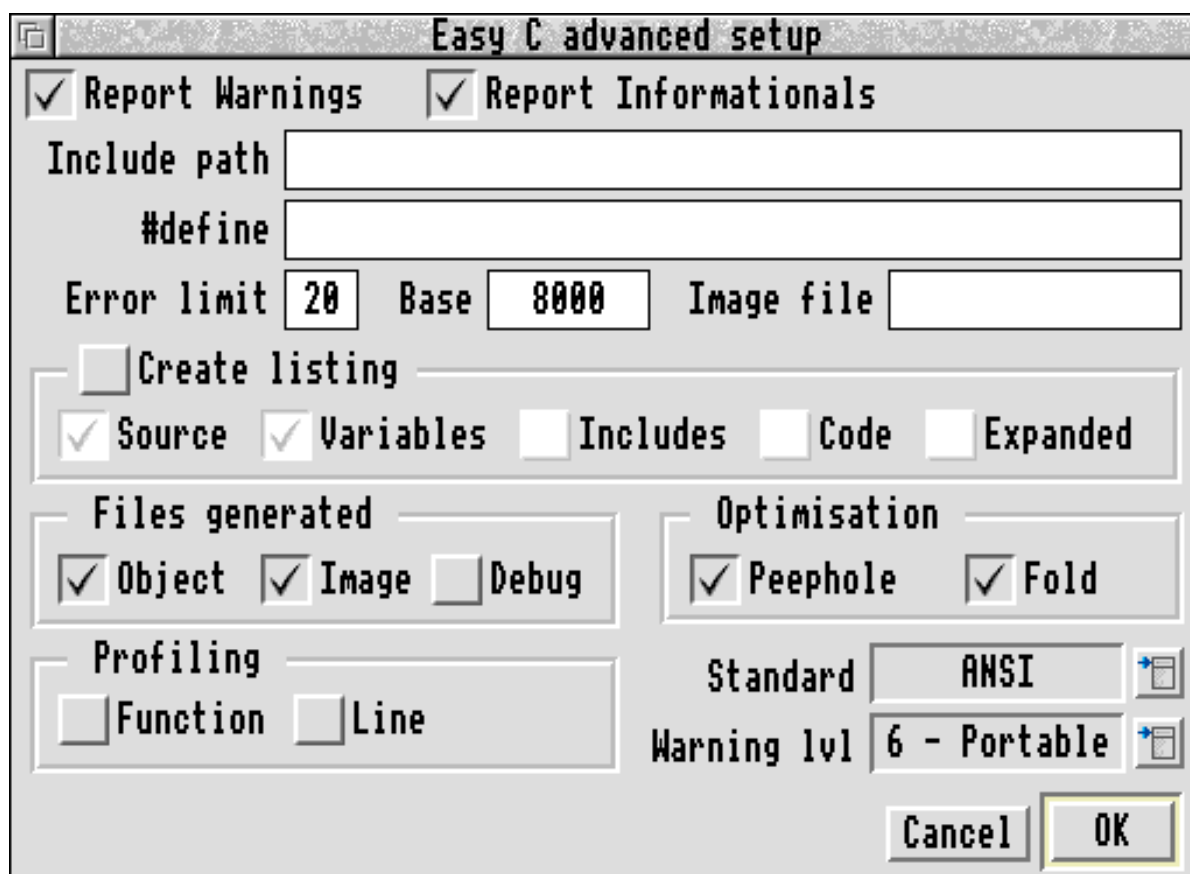
use. As with Easy C, compiling a source file is as simple as drag'n'drop, and, as with Easy C, Acorn's !Make utility will generate a makefile automatically, given a set of source files. Admittedly, when you want to do more sophisticated things, then Acorn C does get complicated, but at least you can usually find out what you want to know. For example, when it comes to customising makefiles, the user of Acorn C is in a far better position to do so than the user of Easy C, simply because Acorn document their makefile syntax.

Conversely, Easy C's installation and set-up is easier than doing the same with Acorn C. Easy C itself is a lot more self contained than Acorn C (which tends to splatter itself all over your hard disc in ways you'd rather it didn't). The !EasyC application contains the desktop front end, the compiler module, the header files, the libraries - everything, in fact, except the sample programs. This is likely to be less daunting to the novice. Acorn C, with its proliferation of strange directories, can be rather confusing (it was to me when I first used it).

As the user of Easy C becomes more proficient, they may find it irritating that there appears to be no way (I couldn't find it in the manual) to have different 'setups' or 'configs' for different projects (different compiler flags, and so on). On the other hand, Acorn C's !Make utility makes this reasonably simple to achieve, even for the person who doesn't want to know how to write makefiles.

Speed

In general use, the Easy C compiler is slow - on average, two to three times slower than Acorn C. On small test programs there isn't much difference, but once you start dabbling in Wimp programming, with its associated header files, the difference becomes much more marked. As someone who finds Acorn C a bit slow, I found the slowness of Easy C bordering on being painful. (It's perhaps interesting to note that Easy C is written in assembler. whereas Acorn C is written in C... food for thought, perhaps?)

The author claims that he has recently speeded

up compilation by about 23%, and said that compilation will go faster still if you use a Task window. However, I couldn't see how it would be possible to use a Task window and still use the Easy C make facility at the same time.

Support programs

The linker provided with Easy C is functional, and should be adequate for most needs. The librarian can be described in a similar way, although it is frustrating that while Easy C generates standard AOF format object files, the library files generated by the librarian are wholly incompatible with those produced by Acorn C's librarian. This has caused problems for Easy C users who wish to use libraries produced by people who use Acorn C.

The built-in assembler is a big advantage over Acorn C — to get similar (although admittedly more comprehensive) functionality with Acorn C, you would have to also buy Acorn Desktop Assembler for another £200! The documentation on the assembler is sparse — it is assumed you are familiar with assembler, and know what you are doing. That said, it is pretty simple to run up a routine in assembler using Easy C. Assembler is limited in scope to be outside C functions — that is, you can't suddenly break into assembler in the middle of one of your functions. You can write functions in assembler and call them from C, and call C functions from your assembler routines. The downside is that you must preserve the conditions of the APCS (ARM Procedure Call Standard) when doing so yourself, otherwise your C variables/data may be corrupted, or the program may just crash. However, this is something assembler programmers will be used to (manually preserving entry/exit conditions, that is!). The availability of the assembler can only be considered an advantage in a package such as this.

Conclusions

Easy C is certainly easy to use. Just how much easier it is to use than Acorn C is debatable, but it is certainly a breeze for the novice to set up and start compiling C programs with this package. The comparison with Acorn C is a valid one, despite the price difference. The comparison of using GNU C/C++ is less valid, because, although it's free, it is extremely difficult to set up. Even I had problems(!), and this is by far the commonest complaint about GNU C/C++ - if you're thinking about using it to learn C, my advice is: don't bother.

So you're left with a toss-up between Easy C and Acorn C. Easy C is easier to use, much cheaper, and includes an assembler and a reasonable tutorial. Acorn C is a more professional product aimed at the (semi) serious developer, with more useful support programs (such as !Diff, !Find, a desktop symbolic debugger etc), which is faster to use, and produces faster, smaller machine code, but it costs £200. The documentation for both compilers is competent rather than excellent, although Acorn tend to provide more (in some places, much more) detail with their documentation than you get with Easy C. The author of Easy C is hoping to release a symbolic debugger very soon, and this may also influence your purchase. A symbolic debugger allows you to step through your programs and examine variables to find the bugs at the level of the C source code, rather than having to look at the machine code instructions produced by the compiler. Symbolic debuggers are very useful and can save much time and frustration (when they work properly!).

A serious reservation I have about Easy C concerns its code quality. As mentioned above, I didn't have to try very hard to find some very serious bugs in the compiler — by contrast, I've used Acorn C for about 3 years, and I can't ever remember finding even one bug in the

compiler. I'm told the author of Easy C is keen to receive bug reports, and is said to fix them and provide updates reasonably quickly, but you must weigh this against the fact that if you're learning C, it's easiest if you only have your own bugs to worry about, rather than a comparatively large number of compiler bugs as well. As far as my own tests went, I found that I experienced enough difficulty to cause me to doubt seriously RISC Developments' claim that the system can handle "very substantial programs".

There are also the reliability problems I encountered to be considered. Indeed, many times during this review, I wondered if I was supposed to be beta-testing the product, rather than reviewing it. To be fair, though, the author of Easy C did say that I seem to have encountered more problems than everyone else put together! This may have had something to do with the fact that I was trying to compile what RISC Developments might call "very substantial programs". On the whole, the author is very approachable and keen to receive bug reports so that the product can be improved. Contrast this with Acorn C, of which there hasn't been a new version or update since Release 4 was first launched over 2 years ago.

Despite the problems I had, some might say that for £50 you can't really go wrong. If you're new to C and want to find out more about it, it's a fairly low risk, and you should probably go for Easy C. If you can afford it, and *definitely* if you want to produce commercial applications, then you should go for Acorn C. Either way, stop using assembler and BASIC, whatever you do!

Tim Browse

Easy C costs £49.00 + VAT from RISC Developments, 117 Hatfield Road, St Albans, Herts AL1 4JS. Upgrades are available to owners of RISC Developments' previous C compiler for the Archimedes.

PC Acronyms

I recently received a telephone call from the new Club Secretary, Geoff Stilwell, and during our conversation I mentioned my own interpretations of some of the acronyms from the PC world. Geoff suggested that they might be of general interest, so here are some of the terms along with my own peculiar meanings:

PC   Primitive Contraption
CGA   Completely Grotty Adapter
EGA   Extremely Ghastly Adapter
VGA   Virtually Getting on for Acceptable
.BAT   Botch file
.COM Collapse on Michaelangelo's birthday
AT   Archaic Techniques
MCA   Might Crash Alarmingly
IBM   I've a brain malfunction
DOS   Dodgy, Over-hyped and Stupid
FAT   Futile Attempt at Tracking files
BIOS   Buggy, Inadequate & Odd System

If you can think of any terms I have missed (there are probably loads of 'em) and can let me know what they are, I expect I could think up suitable alternative "explanations" for those too.

John M Ward

Logo Competition

We announced a competition to design a new logo for The ARM Club back in Eureka Issue 9, and were delighted with the response which the competition attracted.

The final logo which we decided to use was designed by Peter Jennings, and can be seen on the metal disc shutter accompanying this issue of Eureka. Special commendation and thanks must go to Peter Reeves-Hall for the numerous and excellent designs which he submitted to the competition.

The Power in my Pocket

A review of the Acorn Pocket Book computer by Toby Smith

The Acorn Pocket Book computer is a small but comparatively powerful miniature computer, capable of being carried around in a pocket but powerful enough to be really useful. The features cover the most popular uses of computing. Included are a:

- Word Processor,
- Spreadsheet with graphing,
- Database,
- Alarm and time manager,
- Display type scientific calculator and spell checker.

The word processor, *Write*, is a seriously good package; do not presume that the physical lightness of the Pocket Book makes any of the software lightweight. All the features of a standard WP are in here, including text effects (bold etc) alignment and the ubiquitous cut and paste. As with all of the applications, this is mainly driven by a nested selection of menus and dialogue boxes from a menu bar at the top (Rather PC-esque) which can be navigated around with the arrow keys, or via use of key shortcuts for these menu options. This is probably the package that you will use most, and it is of a very high standard. Obviously it doesn't have the font based layout power of an application for the rest of the Acorn range, but as a printer typeface WP goes, it's better than a lot I have used in my time. Given an A-
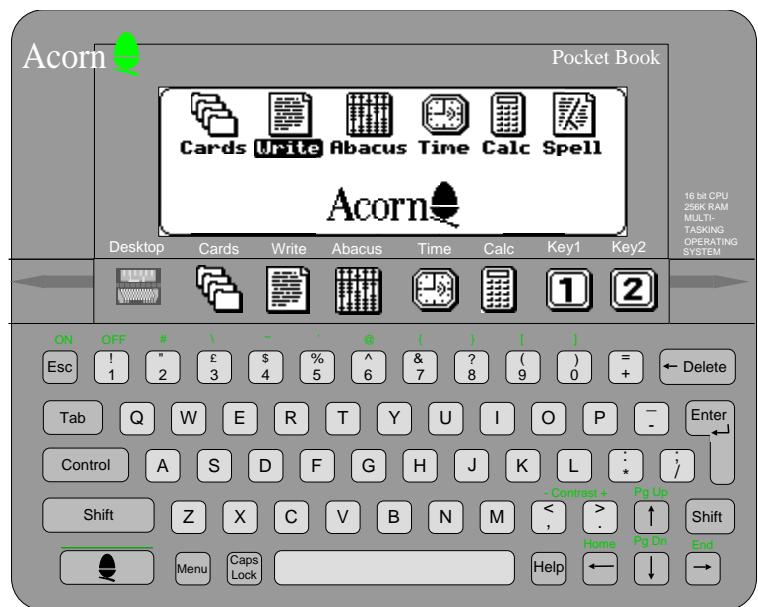
Link, documents from Write can be loaded into any WP / DTP package on the Archimedes and Risc PC, and this expands the power greatly.

The database, *Cards*, is possibly the only package not up to the standard of a complex desktop computer application, as it has no reporting function. Matches to finds can be browsed through, but these cannot be printed in a list. However, as a simple card base containing addresses or similar, Cards, is more than adequate, and massive database management can be left to your Archimedes or Risc PC, which can, after all, handle CSV files uploaded from the Pocket Book.

The spreadsheet, *Abacus*, is a serious big league program comparable to those available for RISC OS, which cost about half the price of the whole Pocket Book. A massive array of functions, are provided and fulfil all but the fussiest needs. Any portion of the spreadsheet can be graphed, on a very good graph program,

```
any of the software lightweight. All the
features of a standard WP are in here,
including text effects (bold etc) alignment
and the ubiquitous cut and paste. As with
all of the applications, this is mainly
driven by a nested selection of menus and
dialogue boxes from a menu bar at the top
▶(Rather PC-esque) which can be navigated
```

which can save out PIC (graphics) files or be printed. The graphics capabilities of even the small dot matrix LCD screen are quite high, but

```
Name:▶The ARM Club
Address: FREEPOST ND6573
         London
         N12 0BR

Find: ARM                          9/11
```

porting onto your desktop computer and using the even better graphics on that is possible. Abacus even contains some line based database functions available, which make up for the shortcomings of Cards to a certain extent.

The *time* function is basically like *!Alarm* on RISC OS. You can define up to 4 alarms which sound even when the Pocket Book is off, giving a pleasing and audible Winchester chimes rendition. You can also set up assorted preferences on time formats, for use in the spreadsheet date functions. You can even set your home town, from the comprehensive list. The time functions are powerful, and show their heritage from the Psion 3 which has a full diary program.

The *calculator* is of the display variety, and can perform many functions, and has use of 10 nameable memories. It's better than a normal calculator but has less features than a programmable calculator, as used commonly in A-Level (and above) maths, mainly as it can't do graphs of functions, an unfortunate, but hardly fatal omission. A package called *Acorn Plotter* is available separately from Acorn to perform these sorts of operations.

The Pocket Book is provided with a *spell checker* on Solid State Disc as standard, something missing on the sister Psion 3. The spell checker can be activated directly from the WP package, and also has its own front-end which can do anagrams, Crossword solving

(give wild-carded letters) as well as a single word checker, features which are very useful if you are into crosswords: One of my friends is a competition maniac and constantly borrows my Pocket Book for this. I believe that spell checkers are one of the real advantages of computers over typewriters, particularly if you can't type, so the inclusion of Spell is a wise and fruitful one! The dictionary is large, containing most of the words you need, and extra words can be added to separate user or global dictionaries. It even spots word repeating in the Word Processor, and warns you, very useful when you get interrupted and loose track whilst typing away on a bus! Case restrictions (such as in place names like England) are used, and the spell checker is phonetic (uses sounds of words).

The Mighty Midget

The Pocket Book also includes some features that elude software on machines 10 times the price (cough PC cough). For example, from within my word processing document I can activate the calculator to evaluate an expression:

```
258.57+sin(45)-(13/4)=256.03
```

I can also use the "*bring*" feature to copy in text which is selected in other applications or files; For example, the following address came from my database into this *Write* document:

The ARM Club
FREEPOST ND6573
London
N12 0BR

The Pocket Book is also a multi-tasking system. You can't use two programs at the same time as this would be infeasible on the small screen, but other files in different programs may be held in memory (running)

and in order to transfer parts to and fro (via *Bring*) or to provide faster access to them.

Help Function

The Pocket Book has a rather large store of help notes which are invaluable when you are out and about. It stores useful information in brief note form, such as a list of all the formulae and their syntax in the spreadsheet, different selection methods in *Write* and so on. This is one of those functions that people don't spot, rather like the interactive help programs for RISC OS (*!Help*) but is invaluable in that it means that you don't have to carry the manuals around with you to look-up the functions, shortcuts and methods.

Keyboard

The main perceived drawback to the Pocket Book is the sheer size of the thing; the keyboard occupies less space than an average mouse and the whole computer is hardly larger than a wallet (I keep trying to change TV channel with it!). However, the accurate key-press, and the gap between the keys helps to make it surprisingly usable. It is quite easy to use on a two or one handed hunt and peck system, and you will numerous other methods to suit different situations.

Inside revealed

The technical and physical specifications of the Pocket Book are a real parody. The Pocket Book is about a third the size of the good old Sinclair Spectrum, and about 16 times more powerful. It runs on a 16 bit chip, with 256K memory (sounds rather like certain popular home computers doesn't it!) and a completely multi-tasking operating system, with many

common controls between packages (Oops, there goes my comparison!) On the storage side, the Pocket Book filing system is a DOS clone, and is essentially hidden unless you deliberately go fooling round in it, but as with all DOS computers, this is unwise and on the whole unnecessary. Certain functions like renaming, deleting and so on are supported from dialogue boxes available from the Pocket Book desktop, and further delving (for the masochistic) is allowed. The Pocket Book has an internal RAM drive of 170K which is sufficient for most things as you are really only storing text and not the layout and graphics data that make the similar Archimedes files so big. When you consider that this article, some 5 pages of close printed text only uses 10K you get a good idea. Flash RAM SSDs (write once, format to blank) and RAM SSDs (write & read many) are available to fit in the pod bays underneath the Pocket Book should you need more.

Parallel printing

The parallel lead (£25) allows direct connection of the Pocket Book to a parallel printer. This is quite funny as the minuscule 6 pin connector at the Pocket Book end of the lead is hardly larger than the cable, but the printer connector on the other end, being about the same size as a dongle, takes up half as much space as the entire Pocket Book, the whole effect looking rather like a Mini trying to tow the QE2 about, and succeeding. The Pocket Book applications print out in the printer's own typefaces, with bold and italic variants as specified. The Pocket Book has drivers for the Canon BJ10ex & BJ30, IBM

	A	B	C	D	E
			CREDIT	DEBIT	BALANCE
1	DATE	REF			
2	10/10/92	BALANCE FORWARDS			£300.00
3	7/3/94	POCKETBOOK		£198.58	£101.43
4	7/3/94	A-LINK		£49.35	£52.08
5	7/3/94	PARRALLEL LEAD		£29.38	£22.70
6	12/3/94	CLUB SUBSCRIPION		£10.00	£12.70
7	13/4/94	WAGE	£100.00		£112.70
8					£112.70

C4

proprinter, Epson RX & LQ and a general driver suitable for many other printers, if they can't emulate any of the above.

A-Linking

Also available is a serial port link to any of the "bigger" Acorn machines. Software (!PocketFS) supplied with this turns the Pocket Book into an extra filing system, and files can be transferred too and fro. (A new version of this with improved name extension handling has just been released) Use of this is easy and simple. You can either opt for a faking of the Pocket Book desktop and drag files from this (they will be appropriately converted) or for a directory viewer, offering closer access to the Pocket Book. Suitable conversions to standard filetypes are available, so transferring data to and from the Pocket Book could not be easier. For example, this entire article, screenshots and all, was produced on the Pocket Book, then uploaded onto a disc and straight off to the editor. Easy isn't it!

Becoming a palm top junkie

Using the Pocket Book is a delight, I picked it up quite easily, and this article is one of the first things I started. The Pocket Book is highly portable, and the new frontiers of this take a little adapting to, but you quickly learn to type on your lap (currently I am semi-watching the winter Olympics), and move about at will. After a short acclimatisation and learning period you get quite used to it, and can flick round like an expert. The learning curve is quite gentle, but alarmingly fast, probably due to the identical shortcuts in the applications, something we Acorn owners are used to. Typing at any suitable speed does require at least two fingers on different hands, so you do have to rest the Pocket Book on something, usually your knee. If you can type, you will be able to use the Pocket Book. if you can't don't expect a smaller keyboard to be any easier than a normal sized one. If one the move, I use a weird system of holding the Pocket Book with my hands and

typing with the thumbs. Typing whilst lying on one's back has quite a novel feel, and really must be tried!

So who should have a Pocket Book?

Despite looking like an expensive but pointless toy, they are not that expensive, considering the nature and level of the software, and their power far outweighs that of a toy. The first category that it will appeal to will be those who have toyed with the idea of a portable computer due to needing information on a portable scale, but who have a fixed base at which they have a normal desktop computer (which, being a discerning user, is an Acorn). The Pocket Book is ideal for this, being portable and considerable cheaper than an A4, or even a low class PC portable, and capable of handling the data with ease, and transferring with the big machine whenever necessary.

The second group I would recommend Pocket Books to is students in higher education, and even A-level. It is my firm belief that doing such a course without the use of your own WP, or at least a typewriter, is stupidity. The Pocket Book is one of the cheapest ways to get an amazingly good WP package, with the database and spreadsheet being an added bonus; inside just one week I was surprised how much I actually used the spreadsheet (and all my friends found putting their addresses in the database a great treat). Most people have some form of access to a printer, and with the appropriate lead (see later), the Pocket Book is happy running this alone, or use a RISC OS computer to act as middle man and typesetter.

Acorn's grand idea for the Pocket Book was as a miniature educational computer, on a one per pupil basis. Whilst it would perform this task brilliantly, and would be more practical and cheaper than a normal portable, there still lies a problem. Education is universally skint, and £200 per pupil is out of the reach of even the most technically advanced. This is a great pity,

but I am sure that with technology like this, the day will come.

DeskEdit III

*A review of this perennial package
written by Dave Gili*

The review copy of DeskEdit III arrived on a single disc in the usual RISC Developments wallet, along with a slim manual (71 pages, plus a 16 page supplement to cover changes in DeskEdit III, keystrip and quick reference card. I was initially surprised at the huge number of options listed on the keystrip compared to the apparent brevity of the manual, more of which later, and contented myself with installing the application on my hard disc via a standard copy procedure, and examining the reference card.

So why another Editor?

If RISC OS was UNIX, it is very likely that the alternative title for DeskEdit III would start with the letters YA, standing for "Yet Another". With the plethora of text and source editors available, ranging from the neat simplicity of Acorn's own to the self-proclaimed "overflowing sink" of EMACS, do we really need Yet Another Editor, and if so, does DeskEdit III fill the gap, and then fill the gap without placing unreasonable demands on a low-end machine? What does it offer which other editors do not?

Facilities, and In Use

One only needs to glance at the top section of the main menu to see that DeskEdit III takes Edit as its layout inspiration; the top five entries in the menu, and with a few exceptions the menu tree therefrom, are identical to those in the Acorn application.

The main menu to DeskEdit III

The first option with extended functionality over !Edit is the Save facility; DeskEdit comes configured so that F3 performs a "standard" save, Ctrl-Shift-F3 saves and then runs the edited file if it is a BASIC program, Shift-F3 performs a "backup" save to a filename embedded within the first 200 characters of the program, Ctrl-F3 when DeskEdit is in Text mode saves plaintext in a format suitable for importing into other packages, and Escape-F3 performs a DeskEdit "extended" save, in which specific DeskEdit information such as the position of user-placed "invisible markers" and editing history data is saved in a file called DeskEdData in the same directory as the file being edited. The degree of "extended" nature

may also be configured from DeskEdit's Choices menu between "full", which saves up to 5K of editing history in addition to markers, and "brief", which omits the history data.

This system, although configurable, illustrates one of the steeper parts of the learning curve in DeskEdit. It should be noted that so many options (56, including the standard RISC OS functions assigned to F12) have been crammed onto the function keys that the Escape key has been assigned as a key modifier to behave in much the same way as Shift and Ctrl; a move which I class as being of benefit, certainly, but dubious overall owing to the unconventional nature of the assignment. Even the Print key is subject to this system; where Print produces a standard hardcopy, Ctrl-Shift-Print gives the word and page count for the document, and the number of words on the last page. One of the changes between DeskEdit II and III is that the Break key has now been spared this treatment; the functionality previously assigned to Break is now assigned to a rather awkward double-Escape sequence.

In common with other multi-purpose editors such as !Zap, DeskEdit has discrete editing modes for BASIC, C and plaintext; a set of user-definable hotkey macros is provided for each of these modes, and the dedicated language modes come equipped with such useful features as matching of quotes and braces. An unmatched quote, for instance, or a missing semicolon at the end of a line of C source which is not a preprocessor directive, will generate an appropriate warning. For BASIC, an on-line keyword help system is available, and the C

help file from Acorn's DDE SrcEdit may also be merged in. Full C compiler Throwback is supported.

In all cases, "invisible markers" may be embedded into the file, such that the user can move to the position of a given marker with a keystroke. Owing to the undoubted popularity of this feature, RISC Developments has increased the number of markers by another twenty over those present in DeskEdit II.

Perhaps the best-implemented feature of DeskEdit is the searching system; in addition to bundling Acorn's Find for searching across multiple files, RISC Developments have incorporated a browser (very useful for listing function and procedure definitions) and three different kinds of search. The most useful of these searches is the extended, or "power" variety; this allows bracketing to deal with

The Browser in use

group-limited wildcards, and a logical NOT operator. Using combinations of the new operators provided, it is easy to count (say) the number of numbers, as opposed to raw digits, in a file by using the search string %# and clicking on Count.

Find text

Go   Previous   Count

Find
Replace with

☐ Case sensitive

◯ Magic characters   ⦿ Wildcarded expressions

Any .	Newline $	Alphanum @	Digit #
Ctrl |	Normal \	Set[	]Set
Not ~	0 or more *	1 or more ^	Most %
To -	Found &	Field# ?	Hex ∅

The remaining searches are a "quick" search, useful for finding named function definitions without browsing, and a search-and-replace using search strings compatible with !Edit.

In many cases, the features of DeskEdit are so comprehensive and useful that they could really do with being taken out of DeskEdit and implemented as separate applications to be bundled on the DeskEdit disc; indeed, DeskEdit III already comes bundled with Acorn's Find application and a Desktop trashcan.

A fine example of the kind of feature suitable for separation and bundling is the Programmer's Calculator, which addresses all the needs a programmer could wish for, including "proper" flag and mask calculations, and the facility to insert the resulting word straight back into the source, eliminating transcription errors.

Conclusion

My overwhelming final impression is that DeskEdit III is the most feature-equipped general-purpose editor (excluding Emacs) I have seen on an Acorn platform; however, I am left with the feeling, despite the fact that it runs in 416K, well within the capability of an

A3010, that it tries to do too much. To begin with, there is no real need to have the option to set filetypes, and the user-generated command menu could be considered overkill. Certainly, it suffers for this with the necessity to assign such a huge range of hotkeys and language-sensitive macros, however this is generally necessary in a full-featured editor; even so, the Escape key should never need to be used as a function key modifier, and I am certain that further thought applied to the configuration system may result in the elimination of the necessity for all of some near-duplicated functions to be independently

Bit/byte/word Calc

dec   99
hex   00000063   0   K   char   c
bin   00000000000000000000000001100011

bit: △   0   ▽   set bit   unset bit

+   -   *   /   ^   ⟨⟨   ⟩⟩
AND   OR   EOR   NOT   2s comp
Clear   Import   Export

(Ctrl-Export to Replace)   Enter

accessible at the same time. If you do a lot of programming for which macros are useful, and are prepared to learn large numbers of hotkeys to get around program features quickly, DeskEdit may be the one for you.

Dave Gili

DeskEdit III costs £27.19 ex VAT from RISC Developments, upgrade from II costs £6.00.

ARM Coding – Part 4
Our regular column written by Mark Smith

Firstly, I must start off this issue by confessing that was a slight inaccuracy in the last issue. I said that multiple load / store instructions always load / store the lowest register number first. In fact, I should have said that the lowest register number is placed in lowest memory address. Where addresses are being incremented (IA or IB suffix) the lowest register number is loaded/stored first. If addresses are being decremented (DA or DB suffix) the highest register number is loaded/ stored first.

Stacks

As I mentioned at the end of part 3, I'm going to start by talking about stacks. A stack is a temporary store for data, arranged in such a way that the last item placed on it is the first to be taken off.

For example suppose that you have a some code that needs to use registers in order to do some calculations, but you want the registers to contain the same values at the end of the code as they did at the beginning. To do this the code must temporarily store some registers, use them to do the calculation and then restore the registers to their original values:

Store registers
Use registers for calculation
Restore registers

However, in performing the calculation, you might need to call some other code, for example an operating system routine using the SWI instruction, which, again must return with most registers containing the same value as when the routine was called.

Store registers
Start calculation

SWI call
 Store registers
 Perform required function
 Restore registers
Finish calculation
Restore registers

By using a stack it is possible to store the second set of registers without worrying about the fact that some registers have already been stored.

Using LDM and STM instructions to implement a stack

Suppose an area of memory is reserved as a stack and the start address of that memory is placed in a register. That register is referred to as the stack pointer and by looking at this register we know where data placed on the stack should go and where data read from the stack should come from. By convention, this register is R13.

To start off with, the stack is empty. The stack pointer points to the start of the reserved memory area so the first data that is placed on the stack is put at the start of the reserved memory.

We can then store data on the stack by using the STMIA instruction:

```
STMIA R13!,{r0-r3}
```

This instruction will store registers R0 to R3 inclusive on the stack. Note the use of the ! to indicate that the incremented stack pointer should be written back to R13. If we then wanted to store registers R4 to R7 on the stack, the above instruction could be followed by:

```
STMIA R13!,{r4-r7}
```

Alternatively, all eight registers could be stored on the stack in one instruction:

```
STMIA R13!,{r0-r7}
```

Either way, the result is exactly the same. The eight registers have been stored on the stack, and the stack pointer has been advanced so that it now points to the memory location where the next register will be stored.

To read the data back off of the stack, the following instruction would be used:
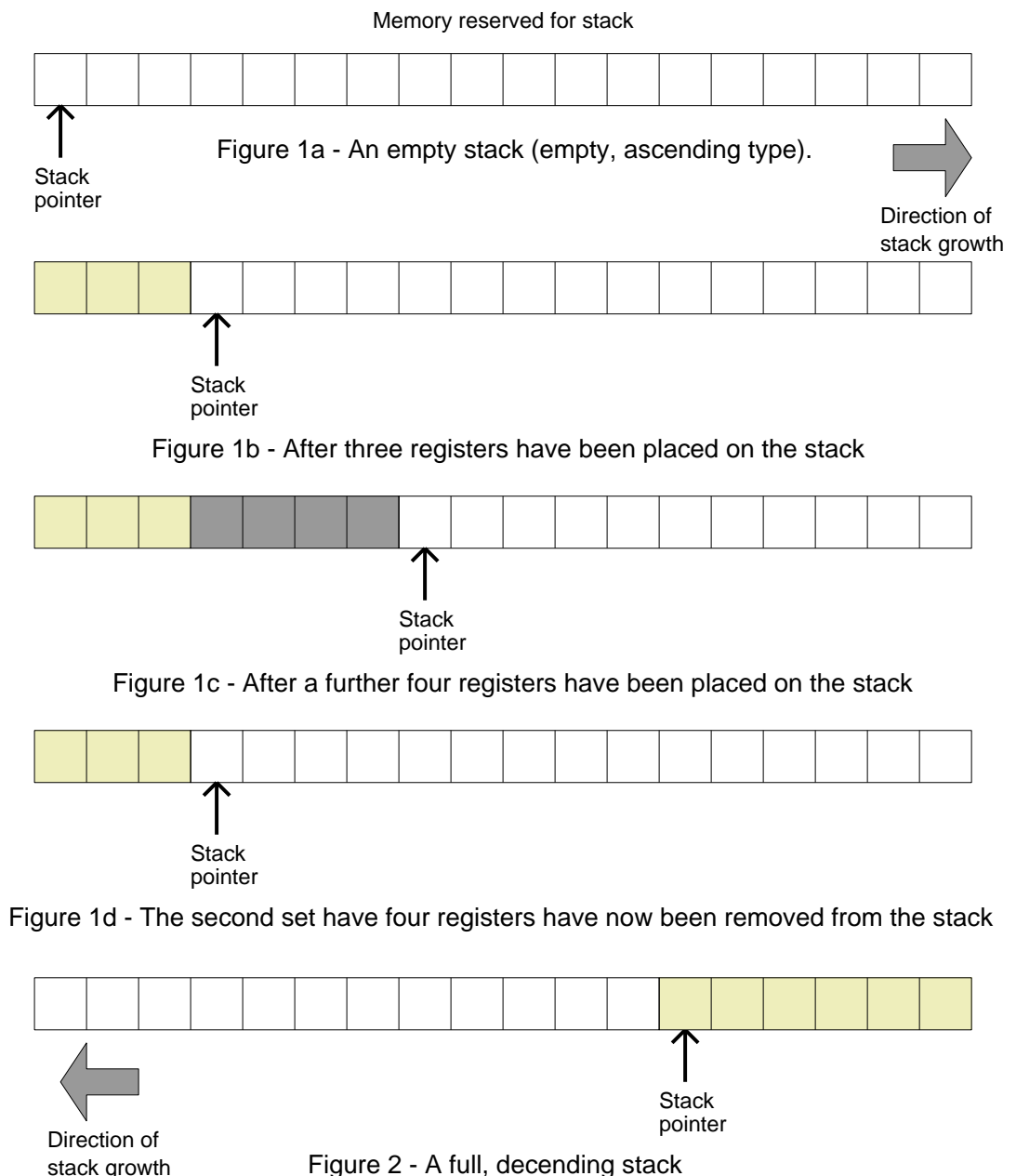
```
LDMDB R13!,{r0-r7}
```

EA — Empty, ascending (STMIA, LDMDB)
FA — Full, ascending (STMIB, LDMDA)
ED — Empty, descending (STMDA, LDMIB)
FD — Full, descending (STMDB, LDMIA)

Empty means that the stack pointer (R13) points to the first free location and Full means that it points to the last occupied location of the stack. Ascending means that the stack grows towards higher memory addresses, Descending means that the stack grows downwards towards lower memory addresses.

The type of stack that I having been describing up until now is an empty, ascending stack.

Note that this time, the suffix is DB. The reason for this is that after STMIA has been used to store registers, R13 points to the next free memory location. Therefore when registers are read back off the stack, R13 must be Decremented before reading each register.

Naturally this can get confusing, so it is possible to use suffixes which describe the stack rather than how registers are going to be written to or read from memory. The four possible stack types are as follows:

Memory reserved for stack

Figure 1a - An empty stack (empty, ascending type).

Stack pointer

Direction of stack growth

Stack pointer

Figure 1b - After three registers have been placed on the stack

Stack pointer

Figure 1c - After a further four registers have been placed on the stack

Stack pointer

Figure 1d - The second set have four registers have now been removed from the stack

Direction of stack growth

Stack pointer

Figure 2 - A full, descending stack

Therefore the instructions which stored R0 to R7 on the stack and then read them back off the stack could be rewritten as follows:

```
STMEA R13!,{r0-r7}
LDMEA R13!,{r0-r7}
```

Figure 1 shows an empty, ascending stack and what happens when registers are stored on and taken off an empty, ascending stack. Note that the stack grows towards high memory addresses and the stack pointer points to the first free memory location.

By convention, RISC OS uses full, descending stacks. An example of a full, descending stack is shown in figure 2. Note that, this time, the stack is growing towards lower memory locations and the stack pointer points to the last used memory location. For example, when you call some code from BASIC using its CALL command, R13 is the stack pointer for the BASIC stack — a full, descending stack.

It is worth making clear that any code that uses the stack must take exactly as much off of the stack as it puts on the stack. Consider the following:

```
STMFD R13!,{r0-r7}
Call subroutine
STMFD R13!,{r0-r7}
LDMFD R13!,{r0-r8}
LDMFD R13!,{r0-r7}
```

The main program starts off by store registers R0 to R7 on the stack and then it calls a subroutine. The subroutine also places R0 to R7 on the stack, does some calculation and returns after erroneously restoring R0 to R8 from the stack. R0 to R7 are restored correctly, but R8 is filled with the next item on the stack - the original value of R0 as placed on the stack by the main program. Not only that, but when the main program comes to restore R0 to R7 from the stack, the stack pointer will be incorrect and

the instruction will end up filling R0 to R6 with the values that should have been placed in registers R1 to R7 and R7 is filled with the last item that was on the stack before the main program was called. So all the registers end up filled with rubbish, the computer most probably crashes with a cryptic error message such as "Address exception" (remember that?) and you
have to reset it. It is also not going to be immediately obvious what is causing the trouble, so be careful!

Subroutines

When writing code of practical use, you will often want to perform the same operations a number of times, perhaps on different data. However, you don't want to waste time and memory including the same piece of code many times.

I have already described the Branch instruction. There is a variant of this, Branch and Link which stores the address of the following instruction in R14 before branching to the new address.

```
MOV    R0,#0
BL     displayR0
MOV    R0,#1
BL     displayR0
BL     displayR0
.displayR0
STMFD R13!,{r0 }
ADD    R0,R0,#ASC"0"
SWI    "OS_WriteC"
LDMFD R13!,{r0}
MOV    PC,R14
```

The above code assumes that R13 is the stack pointer for a full, descending stack. If the code was originally called using BASIC's CALL command then this will be the BASIC stack.

Note that the return from subroutine instruction is MOV PC,R14 which we've met

before when returning to BASIC from an ARM code program.

There is one problem with using BL. That is every time you use it you lose the existing contents of R14. Supposing the following code was assembled and called from BASIC by a *CALL main* command.

```
.main
MOV    R0,#0
BL     displayR0
MOV    PC,R14
```

The above would fail because by the time the MOV PC,R14 instruction is reached R14 no longer holds the original return address, it holds the return address for the subroutine, i.e. the address of the MOV R14,PC instruction. Hence, the computer simply gets stuck in a loop executing the MOV PC,R14 instruction over and over again.

The solution is to store the return address on the stack:

```
.main
STMFD R13!,{r14 }
MOV  R0,#0
BL   displayR0
LDMFD R13!,{r14 }
MOV  PC,R14
```

This works as expected. However, there is one more thing that we can do to tidy up the code. There is no reason why the return address should be read back into R14 and then copied into the Program Counter. The last two lines of the code could be replaced by:

```
        LDMFD R13!,{pc}
```

This will take the return address off of the stack and place it directly in the PC.

It is usual for any routine that calls subroutines to have a line near the start that stores the return address on the stack, possibly along with other registers. The last instruction will usually read the return address off the stack directly back into the PC along with the other register that were originally saved.

For example:

```
STMFD R13!,{r0 ,R4-R6,R9,R14}
......
LDMFD R13!,{r0 ,R4-R6,R9,PC}
```

Mark D Smith

Programmers' Convention

On Saturday 30th April a Programmers' Convention is being held by the ARM Ed Trust to commission, write and review classroom packages that nobody else has thought of. Programmers with an interest in education will be most welcome, along with teachers, Computer Science students, Acorn Hobbyists and education dealers. The meeting will take place during the afternoon of the 30th at Mill Hill School, The Ridgeway, Mill Hill, London NW7. For more information, please telephone 081 959 3321.

Sprite Handling II

The second in Atle Mjelde Bårdholt's series on sprite handling is contained on the Eureka Magazine Disc.
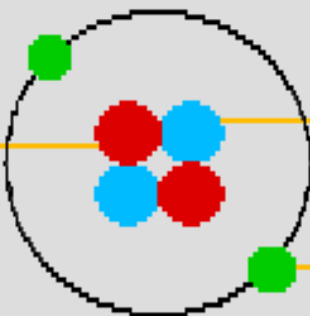
!Printers 1.22

Acorn has released an updated set of RISC OS 3 Printer Drivers, these are available from the Club PD Library for the sum of £1.00. For full details, please see the Eureka Disc.

Chemistry

Bruce Dickson talks about a valuable resource package for schools

The Chemistry package from PTW Software is something I'd have given lots to have had when I was teaching O and A level Chemistry. The highlights for me are its periodic table (click on an element for pics and props, run down a group for electronic structure similarities, whizz across the transition elements to spot the odd

delete parts of the chemical names after using UNGROUP and EDIT within !Draw; at another, sketch unfinished graphs of the likely results). This type of technique could easily be done by groups of pupils as projects, to challenge each other in class.

Can you remember all of the elements?

man out) and the wealth of assembled !Draw clipart files. All of our students with RISC OS machines have long been advised to make their own collection of these, and many have already drawn their own - and consequently know their own filing systems better than that of a bought package. But for newcomers to !Draw this is a super kick-off - and this must include many teachers, especially those lucky enough to have access to a computer in the science building or library.

The aim of the package is revision, but the drawfiles of complete experiments will also be useful to teachers setting tests (at one level,

I was less excited by the drawfiles of notes on minor topics like pH (although a pupil could easily be asked to illuminate them with colours like litmus or universal indicator) or the blast furnace diagram (again changing colours in the different sections would highlight the processes) or the printed notes on the atmosphere. This is an unfair comment; the package fulfils its aim of being an accurate and comprehensive guide to the outline Chemistry syllabus. One day these will all be brought to life by more sophisticated packages like Genesis and Euclid's Mogul film maker, and by ad hoc programs. But for quick revision, it's great to see the old ideas in a new format, for

Element Information

Name	Nickel	Symbol	Ni	Group	T	Period	4

Atomic Number	28		Relative atomic mass	59

Protons: 28

Neutrons: 31

Electrons: 28

Valency: 2

Melts at	1455	°C	Boils at	2837	°C	Density	8.9	g/cm3

Electronic configuration	2,8,16,2

students to use as exercises, for teachers as resources and a stimulant, and for Acorn owners as a challenge to get into the

Iron ore, coke and limestone

A drawfile of a blast furnace included in the package

Gas outlet

500°C

1000°C

1500°C

2000°C

Hot air →   ← Hot air

Molten impurities (slag) run off

Molten iron runs off
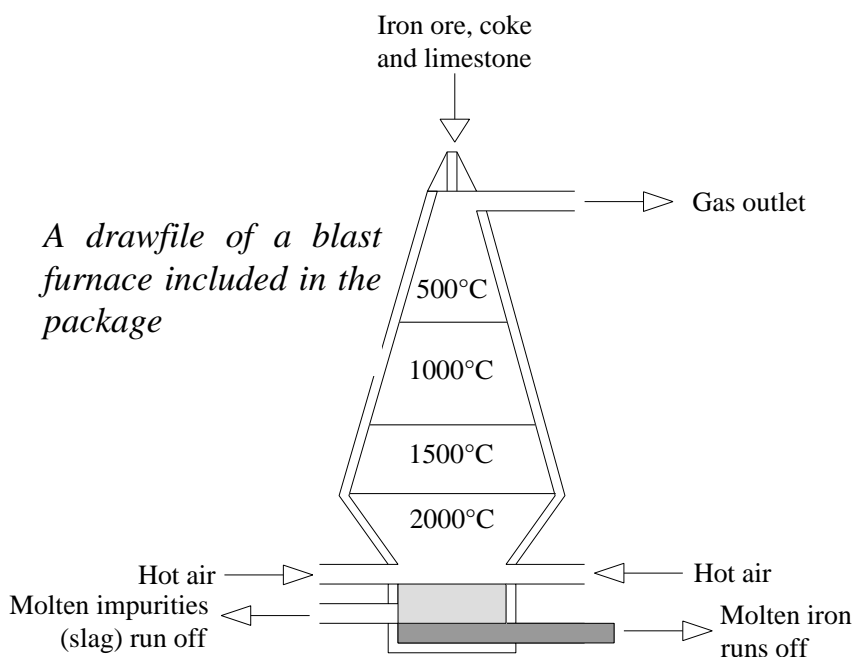
wonderful world of Chemistry. Well done, PTW Software. May you produce lots more. Thoroughly recommended for all Chemistry teachers and pupils.

Bruce Dickson

Chemistry costs £15.00 inclusive from PTW Software. The 2 discs require RISC OS 3.1+.

Classified Ads

Please send in your adverts, they will appear in the earliest possible issue of Eureka.

Education Column: Tessellating Patterns

Let me first introduce myself. My name is Geoff Stilwell and I am the newly elected Secretary of The ARM Club.

I recently received a letter from a teacher member in Sidcup asking for an Education Slot in the Eureka magazine. He spurred me to investigate our membership list and I was surprised to find so many of you involved in education in some way. Indeed, I myself am a primary school teacher, (albeit trying to escape at the moment) formerly an IT coordinator.

He also motivated me to 'take this idea on board' (oh how I hate that expression!) and start the ball rolling with an article explaining an idea that I have used in several year six classes, which really caught the children's imagination.

I must admit that the original idea wasn't mine. I found it in an article written by Mike Charlton, in the ArtWorks Column of the November Issue of Archive (Vol.7 No.2) published by Norwich Computer Systems. The object of the exercise is to create unusual tessellating shapes. It is a relatively simple idea which can be achieved using paper, scissors and sellotape, but the computer makes it so much more simple. Now I don't have ArtWorks on my computer and neither do many primary schools, but the same

effects can be accomplished with !Draw which comes free with Archimedes Computers, and one other application called !OnePath, more of which later.

Now to work!

1. Start up the !Draw application window with a Zoom ratio of 2:1. Switch the Grid menu options 'Show' and 'Lock' on (F1 and SHIFT+F1).

2. Click on the Draw Rectangle tool on the toolbar and drag a square to a 4 x 4 cm size using the grid markers as a guide. As this square is only used as a template you could select it and choose a different line colour from the Style menu.

3. Choose the Open Straight Line Path tool (the one at the top of the toolbar). Starting
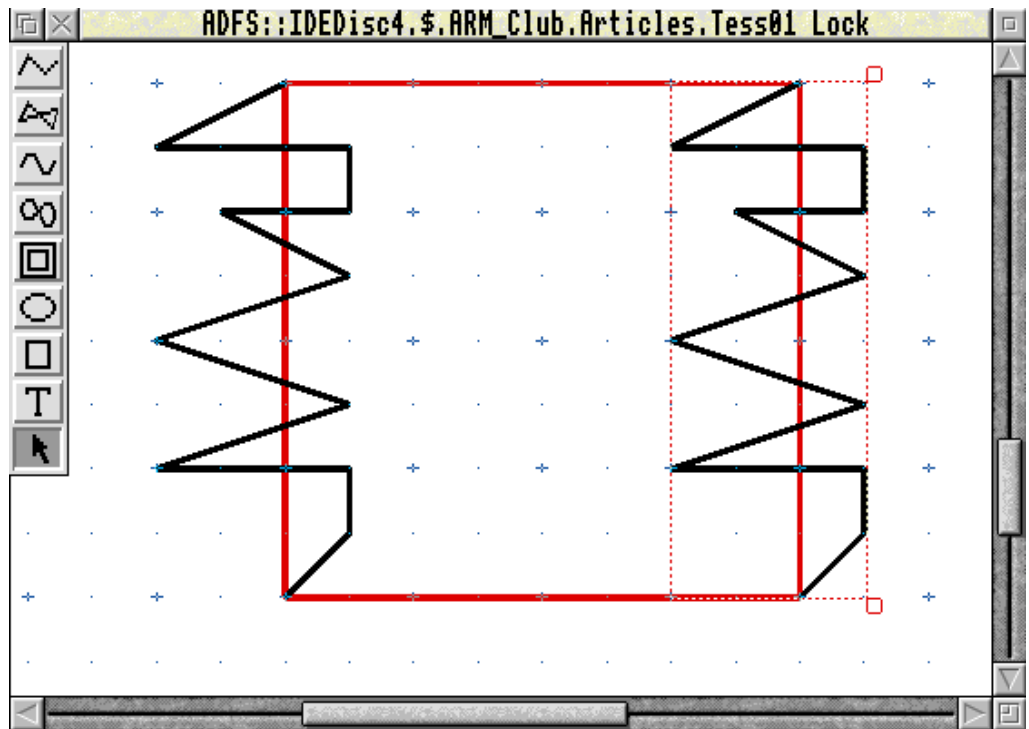
Figure 1

from any corner of the square, draw a path to the next corner, double clicking to finish the path. This path can zig-zag or step in and out of the square. Get the children to experiment.

4. Select this path and copy it (press the copy key). Drag the copy to the opposite side of the square, positioning the ends of the lines on the corners of the square (see fig. 1). 5. Follow steps 3 and 4 again for the other two sides of the square. This is the time for potential difficulties. When drawing the third path you must consider whether any lines will cross those already drawn. This only becomes clear when this path is copied and positioned. If there are lines that cross it is simplest to delete the two offending paths and try again. It is a case of trial and error here.

6. Eventual success will leave you with four paths positioned around the square template. Select the square template only and delete it as it is no longer necessary (see fig. 2).
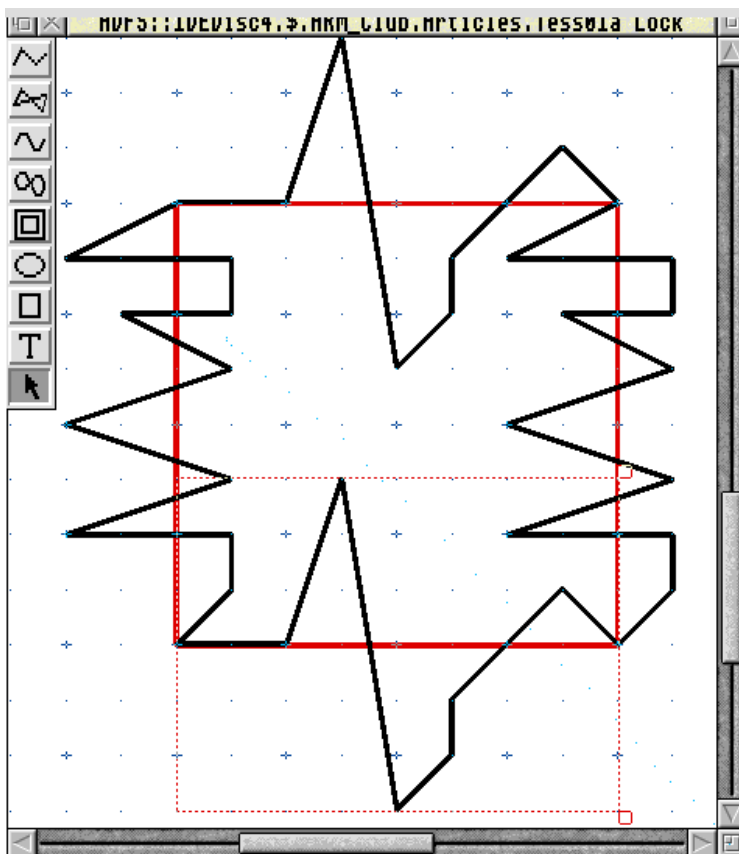
Figure 2

At this stage it would be desirable to join our four paths together creating a shape that can be filled with a colour. Unfortunately this cannot be done from within !Draw. There is a solution. There is an application called !OnePath, written by Peter Bond, which will take separate Draw paths and join them together. This was originally distributed on the April 1992 Risc User magazine disc (Vol.5 No.5). This application has been included on the disc accompanying this magazine. !OnePath is not Public Domain. RISC User holds the copyright but have given permission for the application to be distributed to ARM Club members. Grateful thanks to Mike Williams.

7. Load !OnePath onto the icon bar in the usual way.

8. Select the four line paths in our Draw window. Use the Select -> Select all menu option, drag a select box around the paths or use the select all keypress, Ctrl+A.
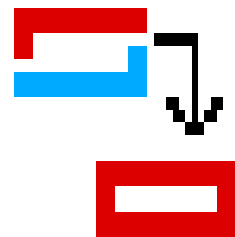
9. Start to Save this selection. Use the Save -> Selection menu option or simply press Shift+F3. Drag the Drawfile icon from the save box onto !OnePath on the icon bar. Another save box will appear saying "Drag Back" with the file titled OnePath. Do what it says and drag the file icon straight back into the Draw window, preferably away from your original lines. This new shape is now joined and complete and can be selected, copied, coloured, etc. (see fig.3)

Problems can occur if there are miscellaneous objects selected when transferring the lines to !OnePath. Another difficulty was that some children didn't double-click to end the lines accurately enough. If the children are
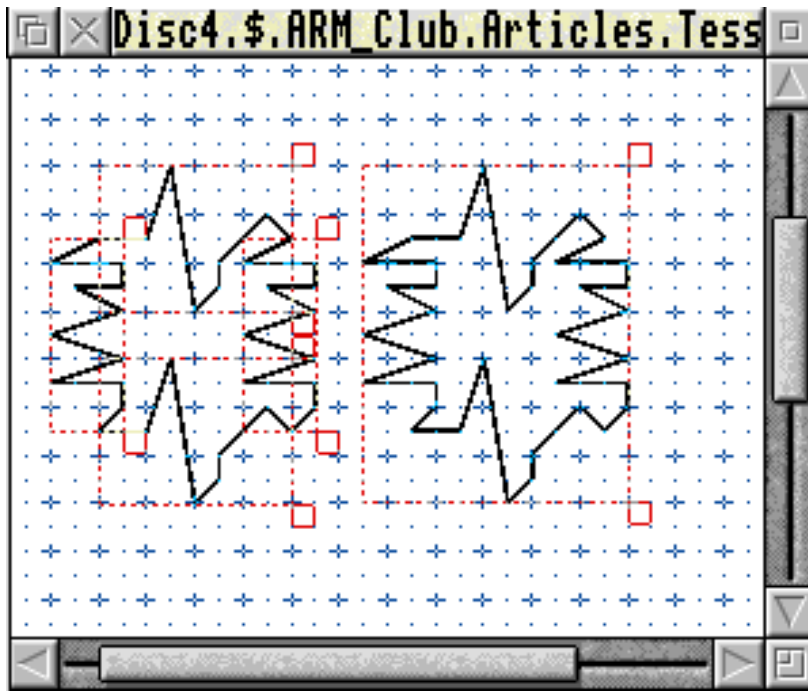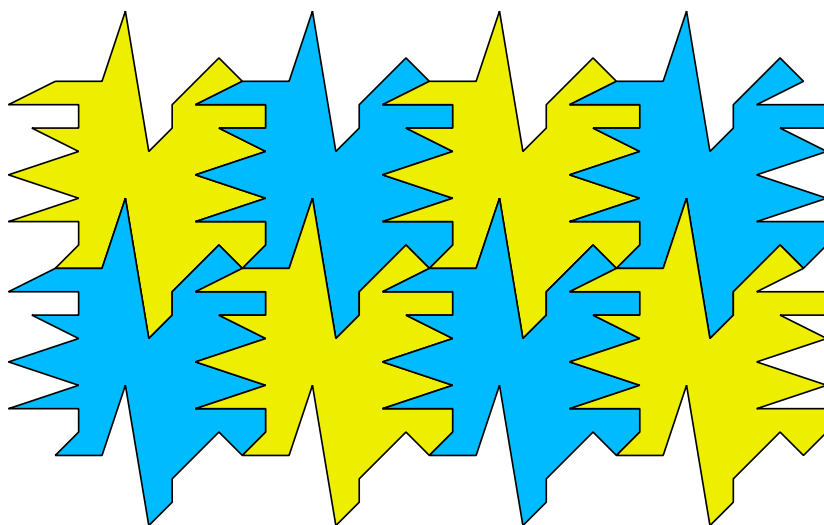
Figure 3

colourful design. Even so the two colour designs tend to turn out best.

13. The rest of the exercise is just to copy the shapes and fit them together. This must be done one at a time to start with, but when you have a few shapes linked together these can all be selected so chunks of your design can be copied and linked in one go. Completed lines can be selected, grouped and copied, speeding up the process further. It is important to have the grid lock on at all times so that the shapes click easily into place (see fig.4)

made aware of this beforehand many of the problems can be avoided.

10. The original lines can now be deleted.

11. Adjust the zoom controls so that you can see a larger portion of the Draw page on the screen.

12. Copy your shape and fill the two shapes in contrasting colours. This is obviously a matter of taste and preference. If your school has access to colour printers then experiment with a

14. Eventually you will cover the whole page and all that is left is to print it out.
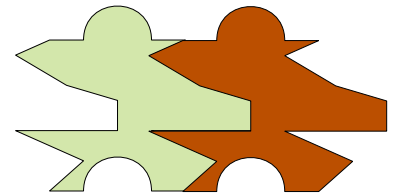
Figure 5

In my experience the children found the straight line paths less troublesome, although some experimented with curved sections and achieved pleasing results (see fig.6). In the Archive article it suggested rotating the shapes. Unfortunately the grid lock no longer matches with the shapes so this has to be switched off to link them together. It is possible to create amazing patterns this way but fitting the shapes accurately requires unlimited patience and large zoom ratios.

Using the Public Domain application !DrawPlus, by Jonathan Marten, makes much of the whole process simpler. For example, selected shapes can be moved using the cursor keys which allows for greater accuracy (quite a consideration when grid lock is switched off). The major difference with DrawPlus is when

Figure 4

joining the separate paths in !OnePath. The selected paths must be saved to a directory window, without the DrawPlus settings, before it can be dragged to the !OnePath icon.

Investigating tessellating patterns fulfils aspects of the Maths and Art curriculum statements. Children always seem to enjoy tessellation activities and the potential for investigation and related work is considerable.

I'm sure you imaginative teachers out there will conceive of many more enhancements to this idea. If you do, or if you have any different ideas or strategies that have worked in your school, send them in to the ARM Club address for inclusion in a future Educational Column in Eureka.

I wrote back to my ori correspondent saying teachers tend to be busy pe Writing an Educational Co is quite a task, but if a l people contribute a little then we can distribute our collective knowledge a bit wider. I hope to hear from more of you.

Geoff Stilwell

If you would be interested in contributing to this column, please write to Geoff at the Club's Freepost address. Even just ideas for articles will be most welcome.

KleinFS

The latest compression package reviewed by Andrew Flower

KleinFS was one of the first pieces of software released by PTW Software, a relatively new Acorn software developer based in Hampshire. KleinFS is a compression utility with a difference, it uses Acorn's standard Squash file format for compressed files. Simple and effective, but just how good is KleinFS ?
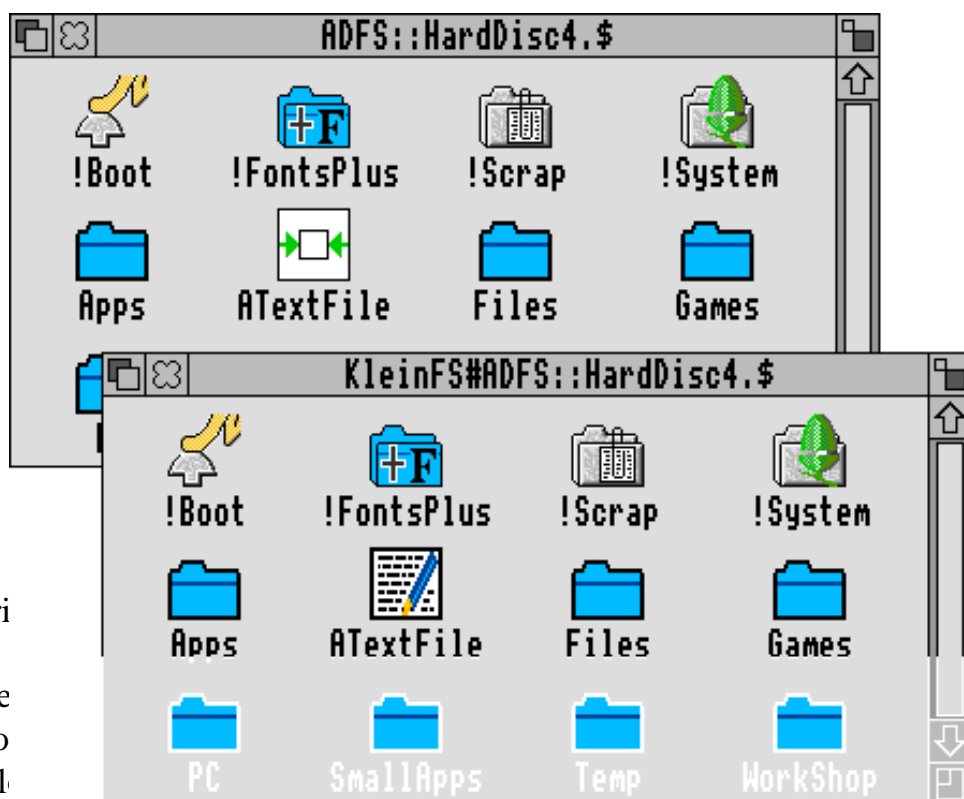
Having used compression applications for several years now, I have had quite a lot of experience of which abilities are most important to users.

There are three things that I find overwhelm all other aspects in a compression program and these are speed, reduction in file size and ease of use.

In order to make a fair comparison I used all three of the compression utilities that I have access to and a simple sprite file which was

153 K in size before compression.

Speed of compression (A4000 — ARM 250)

Klein FS	16 seconds
Arc FS 2	4 seconds
Compression	6 seconds

So KleinFS appears rather slow in comparison to other compression utilities. How does it compare with them on actual reduction in file size ?

New File Size

Klein FS	15590 bytes
Arc FS 2	13964 bytes
Compression	15580 bytes

In terms of actual compression, KleinFS is able to compete with Computer Concept's Compression but ArcFS 2 manages a significant further reduction which is obviously very useful.

Now, KleinFS is comparatively slow and can't manage the most amazing file compression so does its presentation and ease of use significantly improve it ?

There are currently only two methods of compression implemented by applications on Acorn machines and these are ;

1. Using "Archives" which are equivalent to directories but their contents are compressed.

2. Effectively creating a new disc drive and compressing anything that is copied on to it.

KleinFS uses the latter of these two methods and, when installed, places a KFS icon on the icon bar next to the relevant filer icon. As an example I take ADFS::HardDisc4 which, when KleinFS is loaded, is complemented by a new

KFS HardDisc4 icon. Clicking on either the ADFS or KFS icon will display the root directory of your harddisc. ADFS will show a pathname (in the title icon of the window) of "ADFS::HardDisc4.$" and KFS's pathname will read "KleinFS#ADFS::HardDisc4.$". The effect of this is to provide a second HardDisc4 from which you can read not only KFS files but also your normal ADFS files. Whenever a file is saved to this new hard disc, KFS jumps in and compresses the file without requiring any intervention from you.

The KleinFS Filer installs itself into the Apps directory and allows you to quickly re-initiate the application should you require it again after quitting. Another, excellent, feature of KleinFS is the method used to add an extra filing system to those already controlled by KFS. On request of a new icon, a window is opened and you are presented with a simple selection system which allows you to change the Filing System, drive number and sprite that you wish to add.

All in all KleinFS is a very good package with an extremely polished "look and feel" about it. However I think that in terms of its actual potential it is currently, quite limited. With slow compression times and average compression rates it lags behind the other compression utilities mentioned in the review. It does have two things which could redeem it in the eyes of some users though. The first being its simple compatibility with the standard Squash file format and the second is its price. At £17.95 fully inclusive KleinFS beats all of the other compression utilities on the Acorn market. For me, neither of these outweighs the importance of speed and compression ratio and so I'll be sticking with ArcFS 2 unless KFS is greatly improved.

Andi Flower

KleinFS costs £17.95 inc VAT, requires RISC OS 3.1 or later. Club discount: 10%.
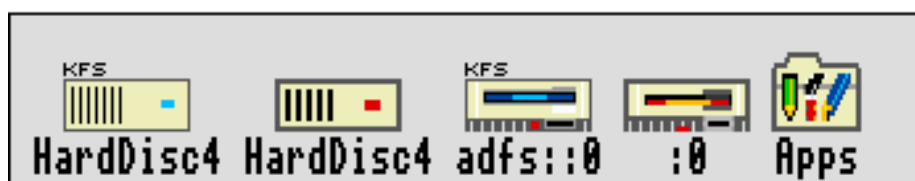
Easy Font

against their names and they can be uninstalled in the same way. In addition, a number of applications including Draw, ArtWorks, Edit, Impression and Ovation can have the fonts they use automatically installed by dragging one of their files onto the icon bar icon. The main window, showing all the fonts, indicates which of them have been installed but a smaller window listing just the installed ones can be opened if preferred.

The most interesting window to use is the font viewer. Drag any font to it from either of the other windows and a sample of its typeface is displayed in a choice of size, weight and style. The window also has a list of the 19 "transformations" which can be carried out on most fonts to create new weights and styles. These can be chosen individually or all 19 can be created together. They are then also available for viewing in the same window.

Any number of fonts can be on the system with a choice of more than 300 available for use at any time. They can be removed very simply and doing so does not delete them. Unloaded fonts are transferred to a "Removed" directory, which will be created if necessary, in the root directory.

Full on-screen help is provided, using the Acorn interactive Help facility from the Apps directory, and the help messages come complete with references to the appropriate manual pages for further information.

This review refers to Easy Font version 1.13. Since it was written, an upgrade to version 2.02 has been released. The main differences are to the windows, which have been redesigned. The manual has been extended

Clicking here allows fonts to be installed for general use.
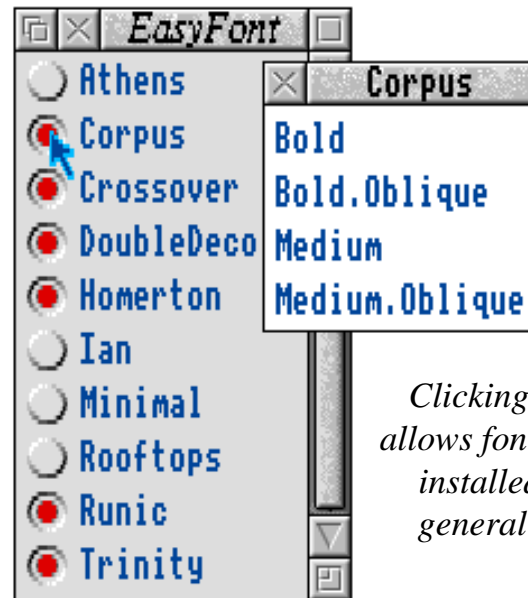
to 31 pages and an additional 13 page "Styles Guide" is now included.

Peter Jennings

Information Overload!

This has been an incredible issue of Eureka to produce due to the large amount of material flowing in, partly due to the approaching Acorn User Spring Show, and partly the amount of material relating directly and indirectly to the new Risc PC from Acorn.

At the time of going to press, more material is coming in by every postal delivery, and my phone & fax never seem to stop ringing! Sadly due to the current production methods used to create Eureka, it cannot exceed 72 pages in size, and as a result many articles have had to be postponed until Eureka issue 12. Some material has been relegated to the Eureka Magazine Disc for this issue, including "other" Acorn news, of which there is a lot, as well as details of new products from third parties. If you have submitted an article which has not appeared in this issue, please bear with us, it has not been forgotten!

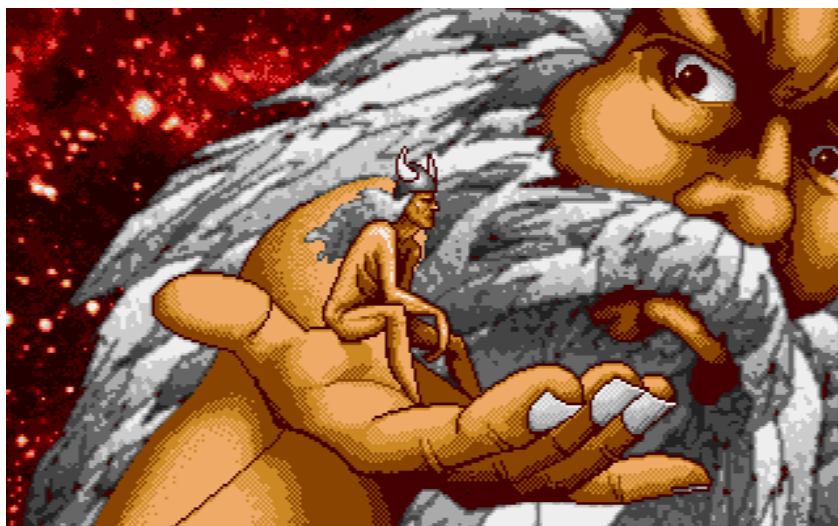**Simon Burrows, Editor**

REVIEWS

The Spring Games Zone

Thanks to all of you for swelling our mailbag over the past few months, your feedback and contributions are much appreciated, and only help to make each issue of The Games Zone even better.

We must admit to being surprised by the large response to our advert for a Games Editor in the last issue of Eureka; without knowing each of you it is difficult to make a decision, so we are gradually inviting applicants to write a games review for us.

The Risc PC from Acorn is good news for the whole games market, it is a very impressive machine, and hopefully some games will be developed to run specifically on it, making use of the stunning graphics and faster speed.

The Archimedes game scene looks to have a lot of life left in it — just look at the top games reviewed in this issue, and remember that other games are about to be announced. Millennium has just announced that its first direct conversion for the Acorn computer is ready, a game called Diggers. If possible come along to the Harrogate Show and see all the latest releases for yourself!

• The Games Zone • FREEPOST ND6573 •
• London • N12 0BR •

Heimdall

Reviewed by Andrew Clover

After a long absence from the Acorn world (and no presence at the last Acorn World show), Krisalis are back, with two huge titles: Lemmings 2, and the extremely long–awaited Heimdall. Opening the Heimdall box reveals the reason for the long gestation period, and the slightly higher than normal price of £29.99: this is a big game. Big for an Acorn game, anyway: it comes on five packed discs and will take up 4 megabytes of hard disc if installed.

A scene from the introduction to Heimdall.
"The Gods would come and talk with men on matters that made no sense. But they smiled and nodded their heads, mainly because the Gods were slightly bigger."

After the initial Krisalis graphic comes something rare amongst Acorn games — an intro. The story of the game is told with text and some pretty good graphics, which are in some small way animated, and some very good music is played. This intro, however, has absolutely nothing to do with the game which follows, and luckily can be skipped once the novelty has worn off.
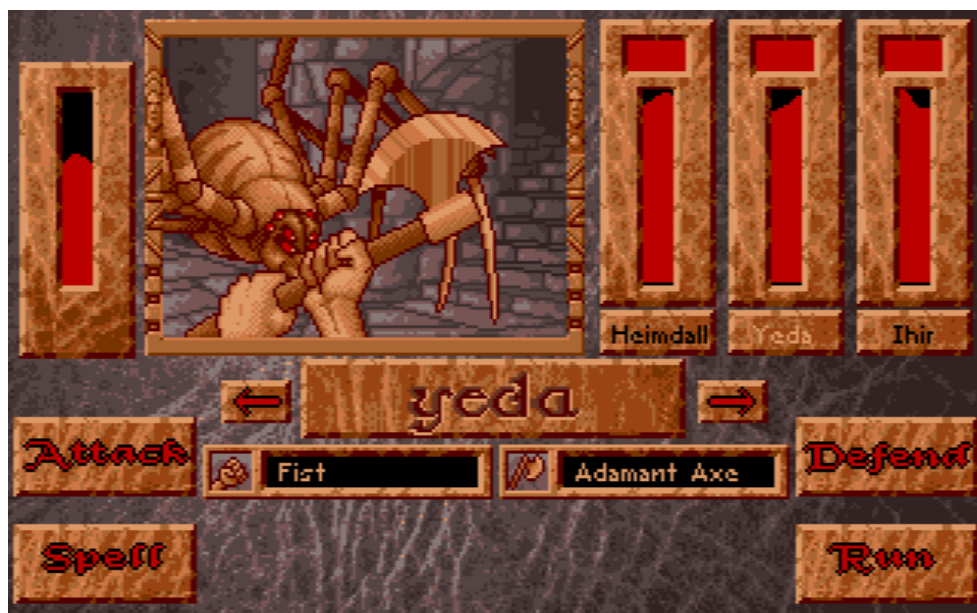
This spider needs more than a rolled up newspaper to make it decide to kick the bucket.

Between the intro and the game itself, there are three sub–games to play. These can also be skipped if you want to get straight into the game, but on the other hand are great fun. The first is the infamous axes game, which surely you must already have seen: you are given 10 axes, 8 lines of hair to hit, and one alcoholically wobbly aiming pointer. Parts like this show the amount of work that must have gone into Heimdall: there's a huge amount of excellent animation even in this very small part of the game, and save for the lack of blood if you make a mistake, this section cannot be faulted. The second game, in which you must catch a greasy pig, and the third, where you have to jump across a boat, contain an equally polished level of graphics.

Heimdall is essentially an arcade adventure, with elements of role–playing thrown in. Characters are of the standard role–playing type, with health, strength, dexterity, luck, magical ability, and a profession, and the results of the previous subgames determine the strengths of the characters you control. The six characters chosen are collected in a ship, which can be sailed around the pretty game map to any of the different islands.

Once on an island, you wander around a collection of 3D rooms, picking up objects, using them, and fighting enemies. The rooms are displayed in the isometric style of games such as Pandora's Box, but as most rooms are bigger than a screen, they scroll isometrically too. The scenery is, as ever, very well drawn, as are the objects and enemies that litter the rooms, but it's a pity that we don't get a full screen of them, merely the smaller rectangle that is visible throughout Heimdall.

More annoying is the fact that when you leave an island and return to it, all the enemies killed will be resurrected and all the unlocked doors re–locked, sometimes making it quite impossible to complete the game; care is needed to avoid this. The traps which suddenly appear underneath you are also a pain, although they can be detected with the right spell at the right time.

What really is impressive in Heimdall is the fighting screen. When you approach an enemy (and almost all other people in the game are enemies), the screen changes to this mouse controlled system, the main feature of which is the large window in the middle containing a picture of the enemy being fought. This, again,

One location in Heimdall of very, very many.

is superbly presented: the enemies always have many frames of animation for attacking, defending, and being killed. You even get to see your own weapon when in use! The fight sequences are perhaps not as sophisticated as they could be, it's just a case of select a weapon and click on attack at the right time, but they are still great fun.

These are the basic elements of Heimdall. There are 3D rooms to explore, not–too–taxing puzzles to solve, and fun fighting sequences. It all hangs together pretty well, providing lots of entertainment — it is a very big game. Three maps full of different islands with different puzzles, graphics, and enemies will last a long time. The problem with Heimdall is really due to this, its largeness. The problem is that it needs data which is originally stored on many floppy discs. So, unless the game is installed onto a hard disc, several disc swaps are required when moving around the islands. This is annoying to say the least. The game itself also needs 2 megabytes even to run. However, to expect anything else would be unrealistic; if the Archimedes is to keep up with the PC, we cannot continue to be limited to 1Mb single–floppy games.

To sum up, this is a large and enjoyable game,

excellently presented. If you like arcade adventures and have a hard disc, it's worth every penny. If you're limited to a floppy drive, it's not as convenient, but is still probably the best game of its type on the Archimedes. The price of £29.99 is certainly justified.

Andrew Clover
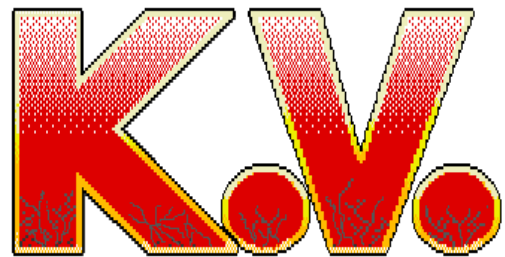
A new budget game from High RISC Software Developments

High RISC is better known as a demo writing group, but has now formed a software house, and KV is its first title.

Priced at £15.00 inclusive, KV is supplied on a single floppy disc in a plastic CD-style case, along with an A4 sheet of instructions. This price puts KV definitely in the budget game category, so what is it like?

KV can be installed on hard disc, although it is copy protected and requires the key floppy disc to be inserted before the game can be run. Once loaded, it follows Acorn guidelines and installs its icon on the icon bar, or rather two icons, one for the game and one for the level designer. Clicking on the game icon starts the game, taking over the whole screen, whereas the level designer runs in the desktop.

My immediate reaction on seeing the game for
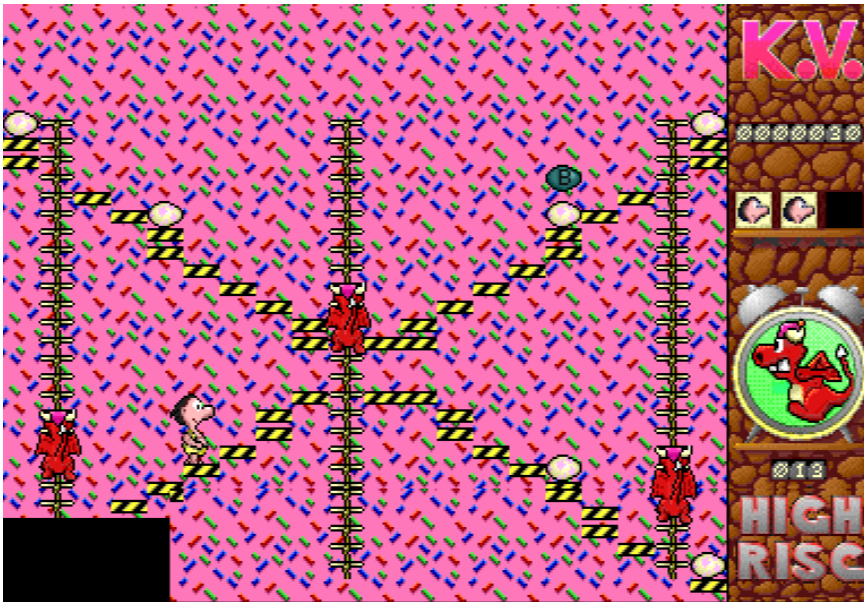
Collect the eggs and avoid the dragons

the first time was "oh, a Chuckie Egg clone", and indeed the game is very similar in concept and design to that classic BBC game. KV supports the Acorn joystick.

The object of the game is to guide your character through 100 pre-defined levels, collecting the eggs scattered around the platforms of each level while avoiding the dragons which wander around. Assorted bonus eggs appear from time to time, and collecting one of these may be advantageous, however doing so takes time — a clock is constantly ticking away, and each level must be completed before the allotted time runs out.

As a typical platform game, the player has to guide the character around the platforms, up ladders, onto elevators and so on. If the character falls a great height, a neat feature is that he blows a balloon which slows the rate of descent.

The levels vary greatly in difficulty — some levels may appear very difficult,

after which there may be a run of easy levels. Initially the character has three lives, although these are easily lost if you are careless. As the levels progress, more dragons tend to appear, and the time limits get shorter.

The KV level designer allows existing levels to be modified if you have completed them, and other levels to be designed. It is easy to use provided you follow the guidelines.

All in all, KV is a fun game to play, although it won't keep you addicted for days. It has good simple graphics, with well-chosen music and sound effects, and is very easy to get the hang of. Priced at £15.00, it is good value, and comes recommended as a game for those odd ten minutes you have spare from time to time.

Paul Johnson

High RISC Software Developments, 51 Mostyn Avenue, Syston, Leicester, LE7 2ET. KV is available from all usual game suppliers.
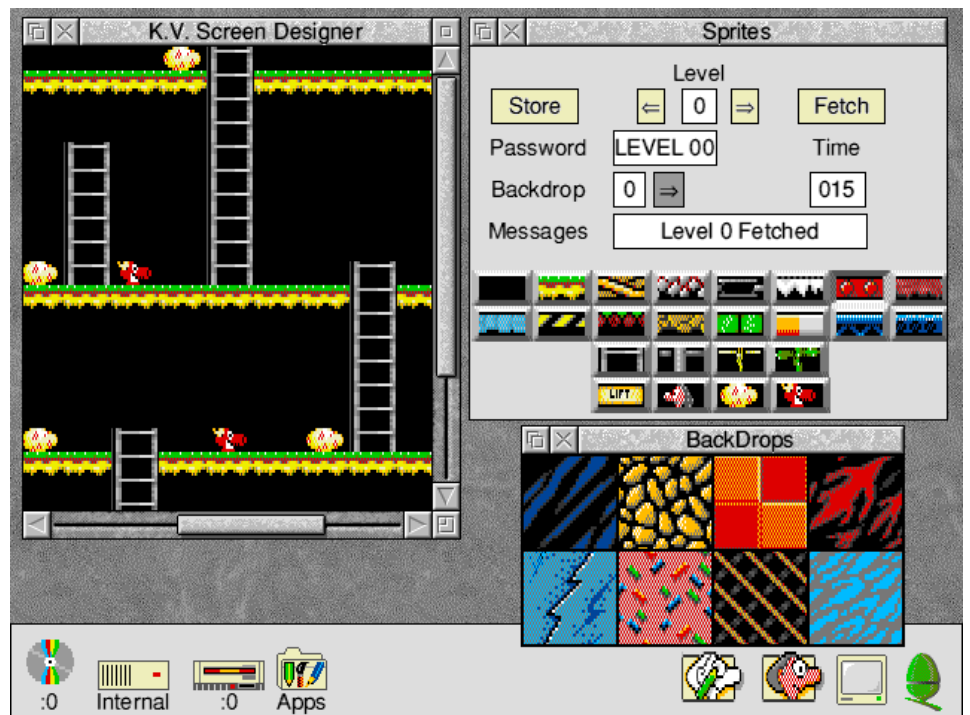
The desktop screen designer in action

James Moore helps those annoying little Lemmings which sane people would prefer to see killed.. Oh, that would spoil the plot..

Once upon a time, many moons ago lived... the Lemmings. These Lemmings consisted of 12 different tribes and they all lived happily in their humble Lemming abodes. Then one day the darkness came and descended on the tribes, the Lemmings decided to evacuate and the only person who can help them is the Guide (guess who?).

Well that's the plot of Lemmings II The Tribes, and it boils down to having to do exactly the same thing which you did in Lemmings 1, namely to guide the Lemmings from an opening trapdoor to their little home at the end of the level. The main difference between Lemmings 1 and Lemmings 2 is the number of skills that the Lemmings can perform. With Lemmings 1 you could have 12 different skills while with Lemmings 2 there are over 50! It takes a little time to get used to all the different skills which range from clever to down-right daft, my favourite is the Lemming which blows up an inflatable Kayak to get across water! Now obviously I don't have enough room to describe each Lemming and its function so suffice to say that it takes quite a time to get to grips with all the skills.

Lemmings 2 is divided into 12 sections (tribes) and each tribe has a different surrounding — these are Outdoor, Circus, Highland, Classic, Medieval, Beach, Sports, Shadow, Polar, Space, Egypt and Caves.

I did find that Lemmings 2 was quite difficult and at the end of the day after I got the game I could only get past level 1 of each tribe. This is unfortunate because on Lemmings 1 there was the different difficulty levels (Fun, Tricky, Taxing and Mayhem) but now it goes difficult right from level 2, it might have been better to gradually make the levels harder so that people would be inspired to carry on and complete 'just one more level'. As far as graphics go the game is not a huge amount different from Lemmings 1 with roughly the same sort of scenery and the Lemmings look the same

A sequence from the detailed introduction to Lemmings II

Tribes must be chosen from the map

(obviously) but fun is now added in that instead of like Lemmings 1 the screen scrolls along horizontally the screen also scrolls vertically making each level very big and sometimes what you have to do can be quite confusing (all part of the fun?). One niggle I found which was rather annoying on some of the levels was that I couldn't tell what the home was meant to be. On Lemmings 1 they made it very obvious because they had a little construction which was the same throughout the levels but on Lemmings 2 it changes to blend in with the background so it can take some time of wandering about before you find the home. As for sound, each tribe has a different bit of music which relates to the kind of tribe you are (eg in Polar you get a carol). I think that there is slightly less actual sound effects within the game but there is still enough to keep the interest. The loading tune is very nice and is nice to listen to while waiting for the game to load. Each level is arranged so that if you get 100% of the Lemmings into their home you get a gold medal, if you get 50% you get a silver medal and if you get 1% you get a bronze medal. A neat touch is that you start level 2 only with the number of Lemmings saved in Level 1 so although it is possible to complete a level by getting one Lemming into his home it is not good long term

because it is more difficult on later levels.

I think Special mention should be given to the incredible introduction sequence which is stored on a separate disc from the game. It is set out in cartoon style with some excellent sound effects and very cartoon-like graphics which altogether makes probably makes this intro sequence the best I have so far seen on the Archimedes. It portrays the story of the Lemmings by having an old wise Lemming telling a little boy Lemming about the Lemming's past and basically goes through the plot which I began with at the beginning of this review. The old Lemming uses his pipe to blow smoke which forms pictures showing the Lemmings and it is all done very cleverly which is surprising since it takes up around 1400k! The manual which comes with the game is probably the very colourful and does create a good impression and it does give a good idea of what you are meant to be doing. The best thing that I found in the manual was the fact that they showed all the Lemmings and said what each one could do I found this very useful and I am extremely glad they included it. The game comes on 3 discs (disc 2 contains extra sound effects for people with 4Mb RAM) and the introduction comes on a fourth disc. Overall Lemmings 2 The Tribes is a very professional product and I could find very few faults in it.

James Moore

Lemmings II The Tribes costs £29.99 from Krisalis Software Ltd, Teque House, Masons Yard, Downs Row, Moorgate, Rotherham, S60 2HD. Tel 0709 372290 Fax 0709 368403.

James Pond 2: Robocod

Andrew Clover turns into James Pond for the day, and learns that life isn't easy.

After much hype, the Archimedes conversion of Millennium's James Pond 2 has been released, not by Krisalis, who converted its predecessor, but by GamesWare. Comparisons with the original James Pond should not be made, though: about all they have in common is the unfortunate use of piscine puns, guaranteed to keep you groaning 'til the next Pond sequel. In the former Pond you controlled James floating around in water, collecting things, and finding the right place to put them. James Pond 2 is a completely different kettle of fish, a traditional platform–game, very much in the style of the Super Mario games. Opening the vast box reveals a multi–platform booklet explaining the game, a sheet explaining the Archimedes version, and the single disc containing the game, which is, as usual, a key disc for the protection system.

On running the !Robocod application, a new icon appears on the icon bar, which must then be clicked on to load the game. As you cannot return to the desktop during the game, and there are no other features available from the icon, this desktop front-end is superfluous [*Acorn guidelines recommend this method of operation — Ed*]; you might as well have dragged the game to the pinboard and run it from there. Once the game has loaded, however, the normal title screen is displayed and some music played. Pressing space starts the game, the aim of which is to save Christmas and defeat Dr. Maybe, or from the player's point of view, to find all the penguin–bombs strewn around the multitudinous levels that represent Santa's toy factory. Once all the penguins in a level have been found (there are usually only a couple), it's off to the exit and the next level. Levels are grouped into themed departments of Santa's toy factory, each having different enemies, platforms, and other graphics.

You start outside the factory, with many doors leading to the departments of levels, and to the occasional huge baddie (who is always very easy to defeat when you've got the knack), and it's to this 'outside' level that you return when a set of levels has been completed. Unfortunately, it's not possible to go into any department at any time; you must finish department 2 in order to play departments 3 and 4, and department 4 must be completed to access departments 5 and 6, and so on. Odd–numbered departments don't actually

He's mean, he's orange, and when you're not doing anything he bops left and right like your dad dancing.

need to be done to complete the game, which I consider slightly strange. Also there is no way of saving the game, and no password system,

The aeroplane not only flies through the air with the greatest of ease — it kills pesky birds too!

so you must finish the relevant levels all in one go or not at all, very frustrating if you die on a late level.

The graphics, as is to be expected from a conversion, are 16–colour based, and very good examples of the cutesy–platform type game. It's a pity, however, that the colourful backgrounds have been lost — the Archimedes can, surely, handle a background in a 16–colour mode and with hardware scrolling. Instead, we get one sole background colour on some levels, and on the others a set of very flickery coloured bars, which the instructions advise can be turned off to make the game run properly on an ARM2. But wait, we've all seen the screenshots, and they do show backgrounds, yes? Well, what you've seen is not what you get. "He's mean, he's green, he's part machine!" insists the packaging; playing the game shows that he is in fact orange. The screenshots that accompany the advertising, previews and the game packaging itself, which do have the non–existent backgrounds, however, portray him as blue! Soundwise, there are a few good sound effects, but unfortunately also the obligatory irritating music that the cute game always

has. Finally, there's one poor title tune.

Of course, it's not graphics or sound that really matters, but gameplay, and as platform games go, the gameplay of James Pond 2 is theoretically very good. All the standard platform game elements are present: moving and bouncy platforms; loads of collectables; question mark blocks to bash; silly baddies and secret hidden bits. The way James bounces on top of the enemies to destroy them (as in the Mario games) is good fun, and the extendable body is an original and fun addition to the platform genre. Why, then, is it only theoretically very good? Well, the game is marred by some terrible scrolling, and the way it occasionally slows down, particularly when James is jumping. I tested the game on an ARM3 and the effect certainly made the game less enjoyable; I found it unplayable on an ARM2 machine. Presumably it is the way James speeds up when running down sloping surfaces, and not this, that is referred to by the packaging's promise "Amazing gravity–impetus super–scroll!".

If James Pond 2 scrolled smoothly, had a respectable frame–rate, and had the pretty backgrounds it was supposed to, I would have no problem in recommending it — essentially, it's a well–designed game, save for the missing save feature. As it is, the gameplay is certainly spoiled by these shortcomings.

Andrew Clover
James Pond 2: Robocod is available from all usual games suppliers, including TMJ Software, or direct from GamesWare.

Carnage Inc.

The Fourth Dimension have been busy making new releases. Here Andrew Flower reviews Carnage Inc., and decides that he rather likes it..

Another of the 4th Dimensions latest release is this new 3D isometric game, rather strangely, called Carnage Inc. Many of you will have seen the adverts for it in the past and may well have noticed that it appears similar to Pandora's Box which was released a couple of years back by the same company.

The fact that the look and feel of the game is exactly the same as Pandora's Box is by no means a put down for Carnage Inc. however, because, as anyone who bought Pandora's Box will know, this type of game is great fun and very challenging (in other words I still haven't completed Pandora's Box!).

The graphics of the game have been improved and there is also a pretty good 3D vector animation to introduce you to the start of the levels.

other peoples rubbish suddenly becomes rather healthy. There is very little help in the manual and I would suggest that a huge amount of guess work is involved (what's new?) in finding out what items to use to perform specific tasks. The hints on the back page of the manual are very amusing and some of them are quite helpful.

Anyway, back to the game. Once you have managed to find a weapon things become a little more interesting (try shooting one of those dull looking guards and see what I mean!). Moving around the screens you will find many things to pick up or to interact with (I would strongly suggest a computer to be a good start) and you will slowly build up a mental map of your surroundings which could be very useful.

The first thing that got me a bit worried was that I was dumped with an unarmed MKII Cyberdroid and left to fend for myself! This problem was, however, soon solved (on the starting screen actually) as you are left to your own devices on the first screen (none of them 'orrible baddies around to get in the way). Oh, and incidentally, you may find that an interest in

the way" whilst playing.

There are only two things that I could fault this game on. First is the number of different controls that can be used to manipulate things. The system of moving a selection box around the necessary set of icons can prove very time consuming in urgent situations (sometimes even deadly), The second problem that I had was that I just couldn't get very far into the game. This is not a harsh criticism as the game has a huge amount of staying power and not once did I get annoyed with it whilst playing. I guess that I just wasn't lucky enough to come across the solution to one or two of the puzzles (or perhaps I just didn't realise that they were puzzles!).

Basically I would recommend this game to anyone who didn't buy Pandora's Box and likes the idea of a good challenge and something different to play on your Arc. If you did buy Pandora's Box then, unless you really liked it, I would suggest perhaps looking at some of the other games around at the moment.

The graphics of the surroundings are impressive. I especially like the fountain effect used for the transporters and the hugely varied sets of graphics used to give the feeling of moving from one area to another. One thing that I found particularly well handled was the way in which the information sections of the screen were place around the edges so that they did not "get in

Andrew Flower

Carnage Inc. costs £25.95 from The Fourth Dimension. Club discount of £3.00 available direct from 4D.

Final Thoughts

The appearance of the new Risc PC is major news for the whole Acorn world. For the first time IBM PC compatibility is available for little extra cost and yet is properly integrated into the computer.

This means that the Risc PC can be promoted to traditional IBM PC users, and indeed Acorn has already booked stands at some dedicated PC shows. It opens all sorts of opportunities to Acorn — for example, the Risc PC is ideal for families since it can run the best educational software for the children and the best PC software for the parents.

The Risc PC is just the spark which could rejuvenate the Acorn world & lead to its expansion over coming years. We would like to place on record our thanks to Acorn and its staff for the information and support which they have given over the past few months in relation to the Risc PC.