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INCORPORATING QL USER

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Colin Opie
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Ron Massey
Rob Massey
Rob Sherrat
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Sinclair QL World,
79-80 Petty France,
London SW1H 9ED.
Telephone 01-222 9090

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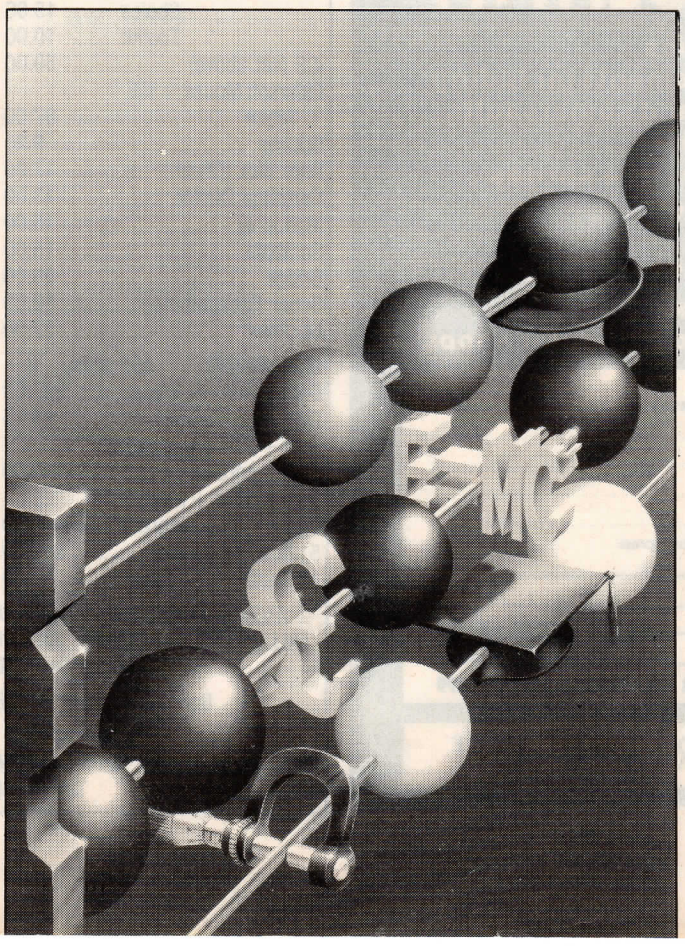

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QL SCENE

Hackers found guilty

Robert Schifreen (22) and Steve Gold (30) perpetrators of the so-called Prestel Hack, were found guilty of forgery and fined a total of £3,350. Both faced charges under The Forgery and Counterfeiting Act 1981 for gaining unauthorised access to Prestel computers.

Sentencing them at the end of the 13-day trial at Southwark Crown Court, Judge Butler QC said: "Forgery is a very serious offence. It would usually lead me to an immediate sentence of imprisonment but I accept that the facts of this case are of an unusual nature."

He qualified his leniency by issuing a warning to all would-be hackers, saying: "I will not send either of you to prison but that does not mean that anyone else who behaves in the future in the way you behaved can hope the courts will take the same lenient view."

During the trial the court heard how Schifreen, a freelance computer journalist, accidentally obtained telephone numbers of Prestel development computers not intended for public access. He then hacked his way past the system's security by entering an ID consisting of 10 2s and a password of 1234.

The computer then promptly provided him with the IDs and passwords of the system manager, the system engineer, and several other BT employees with access to secure areas of the Prestel system. From there it was a simple matter to obtain the ID and password of any Prestel subscriber.

Schifreen then logged-on to Prestel as HRH The Duke of Edinburgh and read the contents of the Duke's private mailbox, which he said "had not been read for 15 months and was very dull and uninteresting."

During the trial, three major points of contention emerged. Under the 1981 Act, a person is guilty of forgery if "he makes a false instrument with the intent of using it to induce somebody to accept it as genuine, and by reason of so accepting it, to do or not to do some act to his own or any other person's prejudice."

In their defence, both men claimed that as they had informed BT of the gap in its security, there was no intention of causing prejudice. There was considerable discussiuon as to whether transmitting another person's password down the telephone line to the computer constituted making a false instrument and whether, for the purpose of the Act, a computer could be considered a person.

Probably their best chance of a successful defence, however, was in attempting to establish that the BT evidence was unreliable. It consisted of a schedule of dates and times at which the offences were allegedly committed, obtained by placing a piece of equipment known as a Miracle call logger the telephone lines of both men.

The defence claimed that information thus obtained was inaccurate in several respects. Telephone numbers contained superfluous digits, times were incorrect and the testimonies of experts called to explain the workings of the machinery conflicted.

The jury, after deliberating for more than five hours, found both men guilty on a total of nine separate counts – Schifreen five, Gold four. After the trial, Gold and Schifreen indicated their disapproval of the verdict and said they intend to appeal.

New QLs announced

In the wake of the Amstrad takeover of the Sinclair microcomputer interests, two companies have announced plans to continue production of the QL with an enhanced specification.

Eidersoft, best-known for its QL mouse and Ice software, in conjunction with disc manufacturer CST, intends to produce a basic QL machine with certain hardware improvements.

Named Thor, the machine specification includes half a megabyte of RAM, a separate IBM PC-style keyboard, integral 3.5 in. floppy disc drive and ports for a 20MB hard disc and a mouse. Two other variations are planned, one with built-in twin floppies, the other sporting 20MB hard disc alongside a single 3.5 in. floppy.

The new machine will also feature improved software, the 128K ROM providing not only a revamped version of Qdos but J Basic and several software packages, including the Eidersoft windows environment Ice.

Eidersoft is aiming to release the machine in the early autumn, probably in September, to coincide with the PCW show. The predicted price is in the £500 – £550 range for the basic machine, rising to £600 for the dual disc version and £700 with the hard disc.

Tony Tebby, author of Qdos, is setting-up a new company to produce successor to the QL. Named the QLT, his machine is to be based on a full MC68000 microprocessor. Like Thor, it will have a minimum of 512K RAM, floppy disc, separate keyboard and improved software, and is expected to sell for around £500 when it is released next January. The machine will also have provision for hardware expansions like a hard disc, ROM cartridges and other peripherals. Both the QLT and Thor will be completely QL-compatible, supporting all currently-available software.

Finance for the QLT will be raised by offering shares on a one per machine basis to initial purchasers of the QLT.

Tebby initially was involved in the Eidersoft/CST project but decided to go it alone because "the interests of individual QL peripheral manufacturers were not compatible with producing the best possible machine." Ken Browning of Eidersoft commented: "Now there will be two different machines and good luck to both of them.

Return to seller

Amstrad are advising owners of faulty Sinclair machines still under warranty to return them to the retailer. A spokesman for the company said "it has always been Amstrad's policy to provide customer service facilities through the dealer network. This has proved successful in the past and we see no reasons to do things differently for the Sinclair products".

On the subject of continuing support and back up for the QL we were told "efforts will be made to ensure that service facilities will be made available, but that will obviously be subject to availability of spares". For the time being the company is advising owners of expired warranty QLs to contact Computafix on 0276 66266.

Comment

The sad story of Sinclair's marketing mismanagement is well enough known to make further criticism appear not only repetitive, but, in the light of recent events, largely irrelevant.

Selling off his company's microcomputer business to Amstrad amounts for Sir Clive to an admission of failure.

The fact that the QL has been to any degree successful and has attracted a loyal and ardent following is in large measure due to its technical excellence. However, rather than capitalising on this by encouraging a further growth of interest in the machine, Sinclair has managed, through its own ineptitude, only in placing obstacles in its path.

Now that Sir Clive has decided to cut his losses, we must look elsewhere for the support that until now has been lacking. Whilst Alan Sugar of Amstrad has made it clear that he does not intend to continue producing the QL, we can at least hope to see improved backup and support for the machine.

More importantly, the news that independent hardware manufacturers are working on upgraded versions of the QL is the most encouraging indication yet that the machine has a healthy future ahead of it.

QL Storage *from* CST

QDISC

Now containing the complete QL Toolkit software as well as an easily used Ram-Drive device driver, the CST QDisc is the longest established and most widely used floppy disc controller for the QL computer. The QDisc interface may be used with virtually any 3.5" or 5.25" floppy disc drives including, of course, CST's dual slim-line 720K (1 Megabyte unformatted) high performance, 80 track double sided drives. The Toolkit software provides a wide range of SuperBASIC commands and functions designed to allow the full power of the QL to be realised without resorting to machine code programming, giving access to job control, random access I/O, character sets, wild card file handling and so on. The Toolkit is included in the QDisc firmware, so it is ready for use as soon as the system is switched on, as is the Ram-drive device driver, which allows any unused memory to be used as a high speed storage medium, ideal for temporary results, and for saving screen images for high speed displays. Naturally the Ram-drive may be used to maximum advantage when used on a QL with additional memory such as the RAM-plus.

RAM plus

Expanding the QL's memory from 128K to the maximum 640K, the CST RAM-plus is based on the latest 256K DRAMs to give full speed no wait-state operation and is housed in an elegant aluminium case which matches the QL and provides an expansion port allowing a peripheral interface, such as a QDisc floppy or Winchester controller to be plugged in. Adding high speed memory to the QL has several advantages: all QL programs run faster, including ones that make heavy use of disc or microdrive as QDos uses spare memory for buffering data; increased data space is available for SuperBASIC, Psion and other application packages and the QL's multitasking ability is greatly enhanced by the ability to load several large programs simultaneously. The extra memory can also be used to advantage with the Ram-drive firmware supplied with the QDisc. For customers who have already purchased an earlier QDisc controller, the Ram-drive software can be supplied on floppy disc at a small charge.

20MBytes!

The flagship of the CST fleet of storage devices for the QL is the 20 Megabyte Winchester drive with integral floppy drive. The system is housed in a compact metal case with integral power supply and is interfaced to the QL by a small controller card. The floppy specification is the same as the standard QDisc; the Winchester is a high performance drive unit based on the new SCSI standard, which allows up to eight drives to be connected to one QL (available to special order). The Winchester firmware is fully compatible with standard microdrive and floppy QDos drivers, and also supports heirarchical directories and file date stamping. The directory structure allows files to be separated into compartments; for example, programs can be held in one directory while data for various projects can be held in other directories. This is essential when a disc can hold over 1000 files! Date stamping of files is used to keep a record of the last time every file on the Winchester was accessed, modified or backed up. This allows the Data Management Utility supplied with the system to archive only those files which have been changed since the last backup was performed. This greatly reduces the time taken to perform regular backups.

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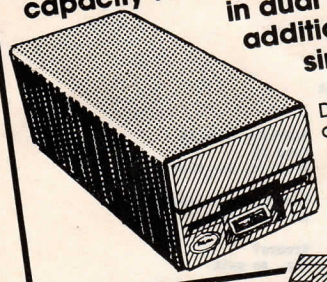

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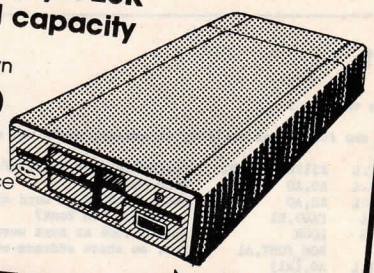

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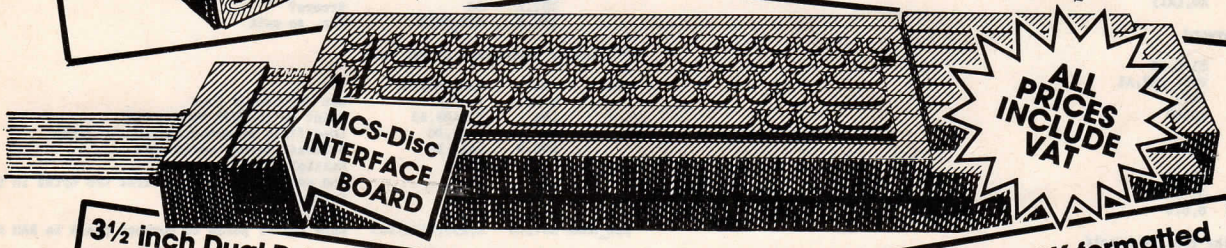

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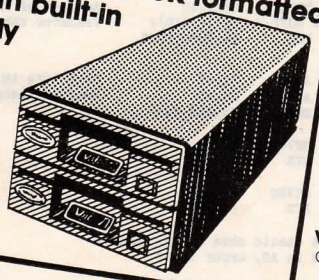

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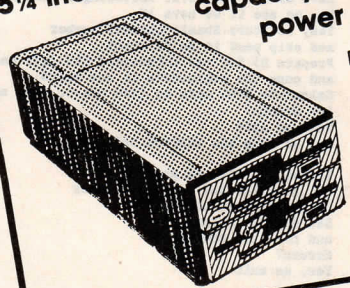

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All drives are compatible and ready to plug in and use with all currently available QL Disc Interfaces. When bought with the MCS-Disc Interface, they are ready to plug in and use.

Other peripherals for the QL

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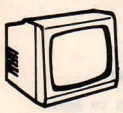

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GRAPHICS

James Lucy shows how to modify the QL Character set to produce anything from space invaders to fancy fonts.

Most computers, including the QL's little brother the Spectrum, have facilities for user-defined graphics. For the uninitiated, that means that the appearance of some of the characters the computer prints on the screen can be modified to suit the needs of the user. In serious applications it is possible to produce characters such as special scientific symbols, or for the games player characters can be defined to resemble missiles, spaceships and other warlike paraphenalia.

If one character is not big enough, several can be defined and printed as a group. You will not need to be told that the QL does not have UDGs built into SuperBasic but with the application of some machine code the shortcoming can be remedied. The machine code routine in listing one

Listing 1

```
* UDG program version 3
*
* First find the font ( Not strictly necessary; could use method in UDG )
*
        MOVE.L  £$1F605428,D1   Characteristic start of ROM font
        SUBA.L  A0,A0           Zero A0
LOOK    ADDA.L  £2,A0           Start looking in word size steps
        CMP.L   (A0),D1         Is it the ROM Font?
        BNE.S   LOOK            No, so look at next word
        LEA     ROM_FONT,A1     Yes, so store address of font in ROM_FONT
        MOVE.L  A0,(A1)
*
* Link in the keyword
*
        MOVE.W  $110,A2
        LEA     PROC_DEF,A1
        JSR     (A2)
        MOVEQ   £0,D0
        RTS
*
PROC_DEF DC.W   1
        DC.W    UDG-*
        DC.B    3,'UDG'
        DC.W    0,0,0
*
* Now describe the routine itself
*
UDG     MOVE.W  $112,A2         Get some parameters
        JSR     (A2)
        CMPI.W  £11,D3          Have we got 11? (i.e. including a chan no.)
        BNE.S   DEFAULT         No, so see if we have 10
        MOVE.W  0(A6,A1.L),D6   Yes, so store Sbasic channel number
        ADDA.L  £2,A1           and skip past it on RI stack
        SUBQ.L  £1,D3           Prepare D3 for the subroutine (10 pars only)
        BSR     COPY_PARS       and copy the parameters to our store
        BSR     CHAN_ID         Calculate QDOS chan id from SBasic chan num
        TST.L   D0              Any errors?
        BNE     ERR_EXIT        Yes, so exit
        BRA     CHK_FONT        No, so skip the section below
*
DEFAULT CMPI.W  £10,D3          If not 11, have we got 10?
        BNE     BP_ERR          No, so write Bad Parameter error
        BSR     COPY_PARS       Copy params to store
        MOVE.W  £1,D6           Set default channel 1
        BSR     CHAN_ID         and find its QDOS id
        TST.L   D0              Errors?
        BNE     ERR_EXIT        Yes, so exit
*
* Now see if we have already redefined the font
*
CHK_FONT MOVE.L  A0,D0          Put id in data register
        AND.L   £$FFFF,D0       Look at word giving position in chan table
        LSL.L   £2,D0           Multiply by 4 because entries are long words

        MOVE.L  $28078,A1       Point to base of channel table
        MOVE.L  0(A1,D0),A1
        LEA     $2A(A1),A1      Font address is at $2A from base of chan def block
        CMPI.L  £$BFFF,(A1)     Is font within RAM?
        BLE.S   NOT_RAM         No, so need to copy ROM font
        LEA     RAM_FONT,A2     Yes, so store its address in RAM_FONT
        MOVE.L  (A1),(A2)
        BRA.S   OK1             And skip past ROM font copy
*
*  Action if font is in ROM:
*
NOT_RAM LEA     CHAN,A1
        MOVE.L  A0,(A1)         Store chan id in CHAN
        MOVE.L  £876,D1         and use QDOS Trap to
        MOVEQ   £0,D2           reserve 876 bytes
        MOVEQ   £$18,D0         of heap space
        TRAP    £1
        TST.L   D0              Errors?
        BNE     ERR_EXIT        Yes, like out of memory, so exit
        LEA     RAM_FONT,A1     No, so point to RAM_FONT
        MOVE.L  A0,(A1)         After Trap, A0 contains base of heap area allocated
* Copy the font
        MOVE.L  £437,D1         Set up D1 for a loop
*
* Persuade channel to use our font
*
        LEA     CHAN,A0
        MOVE.L  (A0),A0         Retrieve chan id
        SUBA.L  A2,A2           Zero A2
        LEA     RAM_FONT,A1     Point to Ram_font
        MOVE.L  (A1),A1
        MOVEQ   £-1,D3          indefinite timeout
        MOVEQ   £$25,D0         SD.FOUNT Trap
        TRAP    £3
        TST.L   D0              Errors?
        BNE.S   ERR_EXIT        Yes, so exit
*
* Transfer parameters to new font
*
OK1     LEA     RAM_FONT,A1
        MOVE.L  (A1),A1         Get address of font
        LEA     PARAMS,A5       Point to our UDG parameters
        MOVE.W  (A5),D6         Load first parameter(character code)
        SUB.B   (A1),D6         Subtract lowest valid character
        MULU    £9,D6           Multiply by 9
        ADDQ    £2,D6           and add 2 to skip past first two bytes in font
        ADDQ    £2,A5           Look at next parameter
        MOVEQ   £8,D5           Set up for 9* loop
NEW_CHAR MOVE.B  1(A5),0(A1,D6) Move LSB of param to correct place in RAM font

        LEA     ROM_FONT,A1     Point to Rom font
        MOVE.L  (A1),A1         Address of font to A1
COPY_FONT MOVE.W (A1)+,(A0)+    Transfer the font to the heap area
        DBF     D1,COPY_FONT

        ADDQ    £1,D6           Next byte in font
        ADDQ    £2,A5           Next parameter
        DBF     D5,NEW_CHAR
*
        MOVEQ   £0,D0
        RTS
*
BP_ERR  MOVEQ   £-15,D0
ERR_EXIT RTS
*
* Expects sbasic chan in D6, returns
* chan id in A0, error in D0
*
CHAN_ID MOVE.L  $30(A6),A0      Point to Basic channel table

        MULU    £$28,D6         Multiply chan num by length of
                                each channel entry
        ADDA.L  D6,A0           and add it to base of channel table
        CMPA.L  $34(A6),A0      Now see if we are off the top of the table
        BGE.S   NOTF            If so, return not found error
        MOVE.L  0(A6,A0.L),D0   Set condition codes with id
        BLT.S   NOTF            If negative, channel is closed
        MOVE.L  D0,A0           Put id in A0
        MOVEQ   £0,D0           No errors
        RTS
NOTF    MOVEQ   £-6,D0          Channel not open error
        RTS
*
* Expects number of pars in d3, A1
* pointing to top of RI stack
*
COPY_PARS LEA   PARAMS,A2       Point to parameter storage
        SUBQ    £1,D3           Prepare for DBF loop
LOOP1   MOVE.W  0(A6,A1.L),(A2)+ Copy contents of RI stack to store
        ADDQ.L  £2,A1           and look at the next item on RI
        DBF     D3,LOOP1        and continue until all pars copied
        RTS
*
CHAN    DS.L    1               Space for QDOS channel id
ROM_FONT DS.L   1               Address of font in ROM
RAM_FONT DS.L   1               Address of font in RAM
PARAMS  DS.W    10              Space for 10 UDG parameters
*
        END
```

adds a suitable command to SuperBasic, UDG, the syntax of which will be explained later. For those without an assembler, a Basic loader is given in listing two.

The third program Font Designer uses the UDG extension to provide a convenient environment in which to design your own graphics characters. In this article we will look at how the QL displays characters on the screen and how we may make changes to suit our needs. To help make things clear, this is an interactive article. Various lines of SuperBasic will be given in the text which, if typed-in in sequence, will form the essential elements of a program implementing UDGs from SuperBasic.

Sinclair prefers the spelling fount to font but however spelt its literal meaning is a set of type. In the computer context, a font is a set of numbers in memory which define the way in which the computer will represent characters on the screen. The legibility of screen characters varies considerably between computers and is a significant factor in the user-friendliness of the machine; very distorted typefaces are tiring and continually remind users that they are using a second-rate computer.

The appearance of the characters will depend on the resolution of the screen, the number of characters which are to fit on a line, and the typeface style in use. The maximum horizontal resolution of the QL is 512 pixels – pixel=picture element, the smallest area of the screen the QL can control – which with 85 characters per line implies that each character can be six pixels wide.

In practice, the right-hand one of the six pixels is left blank to provide spaces between the letters. A similar calculation with 25 lines and 256 pixels vertical resolution gives 10 pixels height to each character. The top row of each 10-high block is implicitly blank to allow space between lines. That causes problems if you are trying to make large shapes from several UDGs – use the CURSOR command to abut them. The reason for the 5x9 grid used on the Font Designer and in figure one should now be clear.

The QL uses a sans-serif typeface which is not so clear as that on some other machines, notably the Macintosh, but is a considerable advance on the Spectrum, which lacked true descenders. Since there are several different character sizes available – SuperBasic CSIZE command – it might be thought that different fonts would have been employed for the various sizes, allowing attractive and legible typefaces for the larger characters. In fact, presumably for reasons of space and to simplify the screen driver, the compromises made for the smallest characters are magnified for the larger, which is why the large sizes look rather strange.

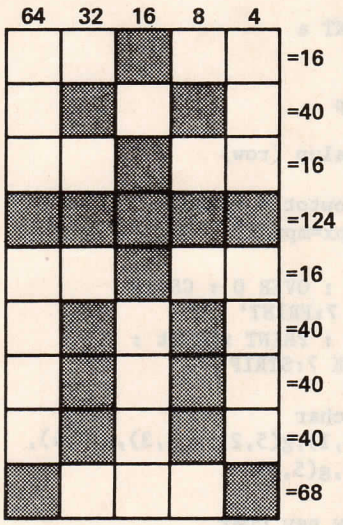
We will now go on a font hunt. Since the QL needs to display characters as soon as it is switched on, the information for the font must be contained in ROM. The precise location varies between ROM versions but immediately after switch-on this expression will print the address of the start of the first font. This is the first thing to type in if you feel so inclined:

chan num=1
rom font=PEEK_L
(PEEK_L(PEEK_L(
163960)=chan_num*4)
=42) PRINT rom_font

On the JS ROM that yields 44442 and the alternate font 45318, the latter obtained by substituting 46 for 42 in the foregoing expression. Both these addresses are, or course, firmly in ROM.

If anyone is wondering where three nested PEEK_Ls come from, here goes. 163960 is the address of the base of the channel table. The channel table consists of

FIG 1.




```
100 REMark Basic loader for UDG SuperBasic extension
110 REMark James Lucy
120 REMark This program adds the extension UDG to SuperBasic
130 REMark and should be run before using the Font Editor
140 REMark If the Remark in line 240 is removed, it will generate
150 REMark a binary file 'udg' in a form useable by Font Editor
160 REMark assuming a JS ROM.
    If you do not have a JS ROM, the 'udg'
170 REMark file may be used by typing 'a=RESPR(512)
    :LBYTES mdvl_udg,a:
180 REMark CALL a' directly after a reset.
    Font Editor may then be run.
190 ad=RESPR(360) : checksum=0
200 RESTORE 250
210 FOR a=0 TO 359:READ byte:POKE ad+a,
      byte:checksum=checksum+byte
220 IF checksum <> 27884 : PRINT 'Wrong data!' : STOP
230 CALL ad : PRINT#0,"UDG loaded"
240 REMark SBYTES mdvl_udg,ad,360
250 DATA 34,60,31,96,84,40,145,200,209,252
260 DATA 0,0,0,2,178,144,102,246,67,250
270 DATA 1,56,34,136,52,120,1,16,67,250
280 DATA 0,8,78,146,112,0,78,117,0,1
290 DATA 0,12,3,85,68,71,0,0,0,0
300 DATA 0,0,52,120,1,18,78,146,12,67
310 DATA 0,11,102,30,60,54,152,0,211,252
320 DATA 0,0,0,2,83,131,97,0,0,232
330 DATA 97,0,0,196,74,128,102,0,0,188
340 DATA 96,0,0,28,12,67,0,10,102,0
350 DATA 0,174,97,0,0,206,60,60,0,1
360 DATA 97,0,0,166,74,128,102,0,0,158
370 DATA 32,8,192,188,0,0,255,255,229,136
380 DATA 34,121,0,2,128,120,34,113,0,0
390 DATA 67,233,0,42,12,145,0,0,191,255
400 DATA 111,8,69,250,0,182,36,145,96,72
410 DATA 67,250,0,166,34,136,34,60,0,0
420 DATA 3,108,116,0,112,24,78,65,74,128
430 DATA 102,0,0,94,67,250,0,150,34,136
440 DATA 34,60,0,0,1,181,67,250,0,134
450 DATA 34,81,48,217,81,201,255,252,65,250
460 DATA 0,118,32,80,149,202,67,250,0,118
470 DATA 34,81,118,255,112,37,78,67,74,128
480 DATA 102,44,67,250,0,102,34,81,75,250
490 DATA 0,100,60,21,156,17,204,252,0,9
500 DATA 84,70,84,77,122,8,19,173,0,1
510 DATA 96,0,82,70,84,77,81,205,255,244
520 DATA 112,0,78,117,112,241,78,117,32,110
530 DATA 0,48,204,252,0,40,209,198,177,238
540 DATA 0,52,108,12,32,54,136,0,109,6
550 DATA 32,64,112,0,78,117,112,250,78,117
560 DATA 69,250,0,28,83,67,52,246,152,0
570 DATA 84,137,81,203,255,248,78,117,0,0
580 DATA 0,0,0,0,0,0,0,0,0,0
590 DATA 0,0,0,0,0,0,0,0,0,0
600 DATA 0,0,0,0,0,0,0,0,0,0
```

Listing 2.
The Basic Loader

Listing 3.

```
100 REMark Font Designer
110 REMark James Lucy Tel. 0621-891715
115 REMark Call the following procedure periodically
116 REMark when typing in the program:
120 DEFine PROCedure update
130 DELETE mdv1_font_bas : SAVE mdv1_font_bas
140 END DEFine
150 REMark The following instruction loads the
      SuperBasic extension UDG
160 REMark It may be included in the program on JS ROMs,
170 REMark but should be typed in as a direct
      command after a reset
180 REMark on other versions
190 REMark a=respr(512) : lbytes mdv1_udg,a : call a
200 DIM g(5,8) : set_up : info
210 REPeat outer_loop
220 x=0 : y=0
230 which_char : draw_grid : show_old_char
    : show_new_char : show_font
240 REPeat LOOP
250 CURSOR 23+20*x,24+15*y : PRINT "*"
260 a=KEYROW(1) : IF NOT a : GO TO 260
270 CURSOR 23+20*x,24+15*y : PRINT "*"
280 SELect ON a
290  =1 : INPUT dummy$ : EXIT LOOP
300  =2 : x=x-1 : IF x < 0 : x=0
310  =4 : y=y-1 : IF y < 0 : y=0
320  =8 : EXIT outer_loop
330  =16 : x=x+1 : IF x > 4 : x=4
340  =64 : BLOCK 20,15,20+20*x,25+15*y,7
         : g(x,y) = g(x,y) XOR 1
350      : totalup y : newchar : show_new_char
360 =128 : y=y+1 : IF y > 8 : y=8
370 END SELect
380 FOR a = 1 TO 25 : NEXT a
390 END REPeat LOOP
400 show_font
410 END REPeat outer_loop
420 tidy_up
430 DEFine PROCedure totalup (row)
440 mpx=64 : rowtot=0
450 FOR col = 0 TO 4 : rowtot = rowtot
    + g(col,row)*mpx : mpx=mpx/2
460  g(5,row) = rowtot
470 CURSOR 140,28+15*row : OVER 0 : CSIZE
    2,0 : INK 0 : STRIP 7:PRINT'    '
480 CURSOR 140,28+15*row : PRINT rowtot :
    OVER -1:CSIZE 3,1:INK 7:STRIP 4
490 END DEFine
500 DEFine PROCedure newchar
510 UDG £4,cc,g(5,0),g(5,1),g(5,2),g(5,3),g(5,4),
    g(5,5),g(5,6),g(5,7),g(5,8)
520 END DEFine newchar
530 DEFine PROCedure show_new_char
540 CSIZE£4,0,0 : AT£4,1,1 : pr :
    CSIZE£4,0,1 : pr
550 CSIZE£4,2,0 : pr : CSIZE£4,3,1 :
    PRINT£4,CHR$(cc);
560 END DEFine
570 DEFine PROCedure pr : PRINT£4,CHR$(cc)&'
    '; : END DEFine
580 DEFine PROCedure draw_grid
590 FOR a = 0 TO 5 : BLOCK 1,135,20+20*a,25,7
600 FOR a=0 TO 9 : BLOCK 100,1,20,25+15*a,7
610 INK 7 : OVER -1 : CSIZE 2,1
620 END DEFine
630 DEFine PROCedure show_old_char
640 char_addr = font_addr(4)+2+(cc-31)*9
650 FOR row = 0 TO 8
660 val1 = PEEK(char_addr+row) : dvx=64
670 FOR col = 0 TO 4
680 g(col,row) = val1 DIV dvx
690 IF g(col,row) : BLOCK 20,15,20+20*col,25+15*row,7
700 val1 = val1 MOD dvx : dvx = dvx/2
710 END FOR col
720 totalup row
730 END FOR row
740 END DEFine
750 DEFine PROCedure show_font
760 WINDOW£4,198,63,272,138 : PAPER£4,4
770 BORDER£4,1,0 : CSIZE£4,0,0
780 FOR a=32 TO 127 : PRINT£4, !CHR$(a)!
790 WINDOW£4,118,32,307,99 : PAPER£4,7
    : BORDER£4,1,0
800 CSIZE 2,0 : STRIP 7 : OVER 0 : INK 0 : AT 0,1
810 PRINT "Character ";cc : CSIZE 3,1 : STRIP 4
    : OVER -1 : INK 7
820 END DEFine
830 DEFine PROCedure set_up
840 MODE 4 : OVER 0 : WINDOW 512,256,0,0 :
    PAPER 7,4,2
850 CLS : STRIP 7 : INK 0 : UNDER 1 : CSIZE 3,1
860 CURSOR 130,225 : PRINT' FONT DESIGNER '; :
    CSIZE 0,0 : UNDER 0
870 BLOCK 448,200,32,16,7 : BLOCK 5,200,480,21,0
880 BLOCK 448,5,37,216,0
890 WINDOW 186,180,49,30 : PAPER 4:BORDER 1,0:CLS
900 OPEN£3,scr_198x60a272x30
910 PAPER£3,2 : BORDER£3,1,0 : INK£3,7 : CLS£3
920 OPEN£4,scr_118x32a307x99
930 PAPER£4,7 : BORDER£4,1,0 : INK£4,0 : CLS£4
940 OPEN£5,scr_198x63a272x138
950 PAPER£5,4 : BORDER£5,1,0 : INK£5,0 : CLS£5
960 PRINT£3,'\'  CSR KEYS  -  MOVE MARKER '\'
    <SPACE>  -  TOGGLE PIXEL '
970 PRINT£3,'  <CR> - ANOTHER CHARACTER'\'
    <ESC>   -   EXIT PROGRAM'
980 END DEFine
990 DEFine PROCedure info
1000 PRINT\\'  FONT DESIGNER provides an   '
1010 PRINT   'interactive environment to    '
1020 PRINT   'generate the parameters       '
1030 PRINT   'required for the SuperBasic   '
1040 PRINT   'extension UDG.  As it is being'
1050 PRINT   'redefined, the new character  '
1060 PRINT   'will be displayed in several  '
1070 PRINT   'different CSIZEs.  When the   '
1080 PRINT   'character has been redefined  '
1090 PRINT   'simply make a note of the     '
1100 PRINT   'nine parameters for use in UDG'
1110 AT 14,2 : STRIP 7
1115 PRINT ' Press any key to continue ':PAUSE
1120 UDG £4,32,0,0,0,0,0,0,0,0
1130 END DEFine
1140 DEFine PROCedure which_char
1150 OVER 0 : INK 0 : STRIP 7
1160 CSIZE 0,0 : CLS : AT 3,0
1170 PRINT "Type the code of the character"
1180 PRINT " to be redefined (32-127):    "
1190 PRINT "     (0 to exit program)      "
1200 AT 7,10 : CSIZE 3,1 : INPUT cc$ : IF
     cc$='0' : tidy_up
1210 IF cc$='' THEN cc$='65' : GO TO 1230
1220 FOR a=1 TO LEN(cc$)
1221  b=CODE(cc$(a))
1222  IF b < 48 OR b > 57
1223   BEEP 1000,255 : CLS 3 : CSIZE 0,0 : GO TO 1200
1224  END IF
1225 END FOR a
1227 IF cc$ < 32 OR cc$ > 127
1228  BEEP 1000,255 : CLS 3 : CSIZE 0,0 : GO TO 1200
1229 END IF
1230 cc=cc$ : CLS : INK 7 : STRIP 4
1240 END DEFine
1250 DEFine PROCedure tidy_up
1260 FOR a=3 TO 5 : CLOSE£a
1270 WINDOW 448,200,32,16 : OVER 0 : PAPER 4 : INK 0
     : CSIZE 0,0 : CLS
1280 WINDOW£0,448,40,32,216 : PAPER£0, 0 : INK£0,
     7 : CLS£0 : STOP
1290 END DEFine
1300 DEFine FuNction font_addr(chan_num)
1310 RETurn PEEK_L(PEEK_L(PEEK_L(163960)+chan_num*4)+42)
1320 END DEFine
```

a series of longword pointers to the channel definition blocks for each channel. The second entry in the channel table is for SuperBasic channel 1 – on start-up – so the expression **PEEK_L(PEEK_L(163960) =1*4)** returns the address of its channel definition block. At offsets of 42 and 46 are the addresses of the fonts in use for that channel. The alternative font mentioned is the one used to print all the foreign letters and odd symbols which appear when you press strange combinations of keys.

The format of the fonts is shown in figures two and three. The first byte contains the code of the lowest valid character in the font, the second byte contains the number of valid characters minus one, and then follow blocks of nine bytes, each block describing one character and each byte describing one row of one character.

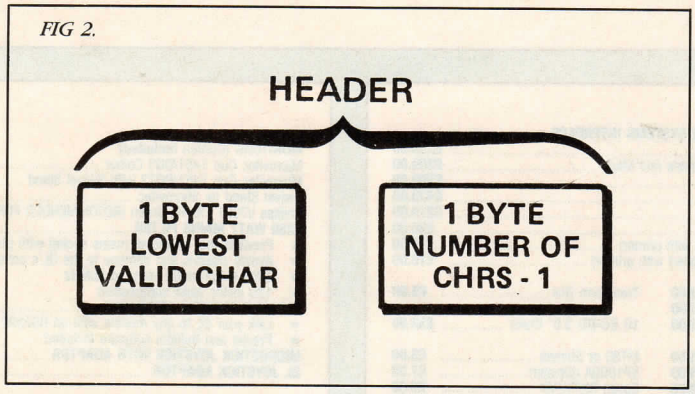
PEEK(rom_font) should give 31, the code of the lowest valid character... **PEEK(rom_font+1)** should return 96, one fewer than the number of valid characters. When the QL has to write a character to screen, it looks to see if the character is valid in the first font; if not, it tries the second font and if it still cannot be found it prints, in the case of the JS ROM, the lowest valid character in the first font. This is the chequerboard pattern and the nine bytes which make it up can be seen by entering:

FOR a=1 to 9: PRINT !PEEK(rom_font+1+a)!

This should print out 84,40,84,40, . . . etc.

Now we know what the font is and where to find it, but there is still a problem. The font is in ROM and so cannot be modified. The solution is to copy it to RAM, where it can be altered as much as we like, and then to make the relevant channel use our new font. Qdos, the QL operating system, provides a routine to persuade any console or screen channel to use a font at a specified address – Tra 3, D0=$25, A0=chan id, A1, A2 – font addresses – or if we know the address of the channel definition block in question we can poke the font address locations direct. This rather unofficial technique is used below, once we have created a RAM font.

FIG 2.



We are now in a position to set up our own font, modifying any of the contents to produce special characters, or modifying all of them to provide a new typeface. As described, the information to create each character consists of a block of nine bytes. Reference to the grid pattern in figure one will show how suitable values for these bytes are produced.

Draw a grid five squares wide by nine squares high. Write the numbers 4, 8, 16, 32, 64 above the columns, working from right to left. Shade-in any squares you require to be ink colour, then calculate the value for each of the nine rows by adding the numbers above the columns which have ink colour squares. That will produce nine numbers which should have values between 0 and 124 and be divisible by 4. They are the bytes which make up the character.

The one remaining problem is to calculate where to put the bytes. These lines of SuperBasic will reserve some space for a RAM font and copy the ROM font into it, assuming you have entered the other lines above:

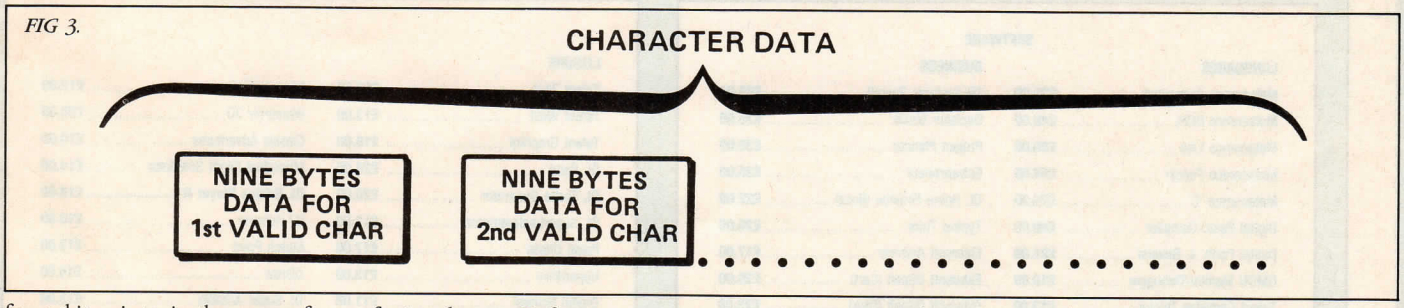
```
ram_font=RESPR(9*
PEEK(rom_font+1)+2)
FOR a=0 TO 874:POKE
(ram_+a),PEEK
(rom_font+a)
```

Now we make channel 1 use our new font:

```
POKE_L(PEEK_
L(163960)+1*4)+42),
ram_font
```

We are poking the address we peeked to find where the ROM font was.

FIG 3.



Suppose we wish to re-define the upper case A, character code 65.

```
LET char_num=65
```

We can now calculate the address of the start of the bytes for the character 'A':

```
char_bytes_addr=
ram_font+2+9*
(char_num-PEEK(
ram_font))
```

All that remains is to poke the values calculated from our grid to the location; you need line numbers for this:

```
10 DATA 16, 40, 16, 124,
16, 40, 40, 40, 68
20 RESTORE 10
30 FOR a=0 TO 8:READ
byte:POKE char_bytes_
addr=a, byte RUN
```

This data will produce a passable imitation of a human figure when used in CSIZE 3,1. To see it just type PRINT"A".

As you will by now appreciate, defining your own characters from SuperBasic is possible but requires perserverance, particularly if you intend to re-define characters in several different channels. The machine code extension to SuperBasic, UDG, works in a very similar way to the method described in SuperBasic but very much simpler and quicker. Once it is loaded, it remains part of SuperBasic until the machine is switched off. The syntax of UDG is as follows:

UDG chan_num, character, par1, par2, . . . , par 9.

Thus if you wish to re-define character 65 in channel 2 to our 'stick-man' shape you would simply type:

UDG 2, 65, 16, 40, 16, 124, 16, 40, 40, 40, 68

The channel number is optional and, if not specified, defaults to channel 1. The character number is not error-checked and should be in the range 32-127.

The Font Designer is an easy-to-use SuperBasic program to generate the parameters for UDG, making use of the UDG extension. Characters are re-defined on-screen and are displayed simultaneously in several different CSIZEs. The complete font is also displayed to facilitate consistency of style if re-defining the whole character set. The method of operation is explained clearly on-screen.

STRONG COMPUTER SYSTEMS

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TOTALLY INDEPENDENT

The Astracom 1000 has its own power supply and can be used with any computer that has a serial port, and so will work with a successor to your QL. Astracom intend to provide communications software for a wide range of computers.

The Astracom 1000 is 7 inches wide by 8 inches deep and 1.5 inches high. It comes complete with software, manual and serial cable, all for

£173.00 + VAT

For free data sheet or further information phone **0792 473697** *anytime*

SUPER Q-BOARD BY SANDY

DESCRIPTION

This is the complete upgrade for the QL completely contained in the Sinclair specified expansion unit.

It looks the same as a normal interface except that the disk socket is moved towards the front of the Sinclair moulding making room for a parallel printer port to be inserted.

Inside together with the disk interface is a full 512K of RAM and the Eprom contains the most comprehensive of Super Basic commands of any interface. A unique feature is be able to set up a printer buffer within RAM.

The design of this unit is of such a high standard that we would suggest that it will not be bettered. Ideal for the work environment and the discerning home user.

SUPERBASIC EXTENSIONS

SPL SPL_USE:- File spooler.
JOBS AJOB SPJOB RJOB:- Job control.
GET BGET PUT BPUT FPOS:- Direct access files.
FLEN FTYP FDAT:- File enquiry functions.
FOPEN FOP_IN FOP_NEW FOP_OVER FOP_DIR VIEW:- Examining a file.
WDIR WSTAT WDEL WDEL_F:- Wild card commands.
STAT:- Drive statistics.
WCOPY:- Wild card copy.
RENAME TRUNCATE
DATA_USE:- Default directory.
CLOCK:- Resident clock.
EXTRAS:- Listing extensions.
FORMAT RAM_200:- Creates 200 sector RAM disk.
RAM_USE FLP:- RAM disk emulates FLP.
PAR:- Parallel printer port with default buffer of 128 bytes.
PAR_USE SER:- Emulates Serial ports.
PARF_3K:- *** form feed with 3K buffer.
PARC_400:- ***<CR> in place of <LF> with 400 byte buffer.
FLP_USE MDV:- Discs emulate MDV
FLP_SEC:- Security level.
FLP_START:- Start up time.
FLP_TRACK:- Number of tracks.

EXPANDERAM 512K

The Miracle Systems Expanderam Plugs into the main port on the left of the QL and has an extension plug to enable a disk interface to be plugged in. The advantages of this method of upgrading are that the QL warranty is not effected and it runs 1.7+ times faster. A cover is supplied with it to protect the cct. boards.

512K INTERNAL RAM UPGRADE

The 512K RAM is supplied on a printed cct. board, and the procedure to upgrade is:-

1. Open QL using posidrive screwdriver.
2. Remove main ROM and plug the board in its socket.
3. Remove main processor and bend up two pins.
4. Put main processor back in socket.
5. Solder four wires onto processor.
6. Put ROM into socket on new board.
7. Solder capacitor onto 5V regulator and test QL.
8. If all is well put screws back in QL.

This upgrade gives the QL a total 640K of RAM and any disk interface can be used with it.
A 90 day Warranty is offered on the QL excluding drives when fitted by us.

CUMANA INTERFACE

The Cumana Interface extends onto the Expanderam or can be plugged into the QL expansion port if the internal RAM upgrade is adopted. It has an alternate EPROM fitted which contains RAM-DISK function as well as the normal toolkit commands.

DUAL DISK DRIVES

3.5" 720K X 720K Dual Cumana drives with NEC mechanisms boxed side by side supplied with all upgrades.

OPEN

Open Channel is where you get the opportunity to voice your opinions in *Sinclair QL World*. Whether you want to ask for help with a technical problem, provide somebody with the answer, or just sound off about something that bothers you you, write to:

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Petty France
London SW1H 9ED

Quill copies

To reply to Derek Coverdale's letter in the April issue While there is no simple way to introduce the printing of multiple copies of documents into Quill, it can be easily done from SuperBasic by the following procedure.'

First, start to print one copy of the document as normal but when the default device of printer is shown, do not accept that but instead type the name of the file, e.g., 'name'. That will produce a standard ASCII file of your document, called 'name _lis' on mdv2_, with all the correct control codes from the printer driver embedded in it.

Next, leave Quill and return to SuperBasic and run the following program:

```
100 BAUD 9600
110 CLS
120 INPUT 'Number of copies?'
;num
130 FOR i=1 to num
140 COPY_N mdv2_name_lis to ser1
150 OPEN #3, ser1: PRINT #3,
//:CLOSE #3
160 END FOR i
```

It may be necessary to change the baud rate or use ser1c instead of ser1, depending on the type of printer used.

Line 150 is necessary to prevent the end of one copy running into the start of the next. You can insert more '/' separators to get more spacing between copies.

This, however, leads me to a question – is any company working on an upgrade to Quill offering such facilities as preserving the justification when using double width, different type styles and proportional spacing – all available on the official Sinclair printer but not supported from Quill, multiple copies, other typeface changes such as italics and double strike and so on?

Michael Scott,
Chester.

File rescue

Help! The unthinkable has happened and I am having to come to terms with the possibility that I have lost around eight hours of computer input. I was updating a draft copy of a 10,000-word document I had stored on Quill and was careful to make a back-up copy of the file as I worked through it. When I made the last back-up, over-writing the previously-stored copy, the program reported "I/O incomplete – press space to continue".

In my confusion, I pressed the space bar followed by the escape key and promptly lost the whole document. When I tried to re-load the file, the depressing message "not a valid Quill file" flashed on to the screen.

It appears that the Microdrive was full when I tried to make the last back-up and that accounts for the "I/O incomplete" report. I still have the corrupted file, plus its associated def-tmp file, stored on the Microdrive, so the document must still be there somewhere. The problem is how to get at it, preferably without resorting to the rather expensive disc-doctor type programs.

Is there any way of re-validating the corrupted file so that I can at least save some of the lost information? I have back-up copies of the draft copy but the thought of typing-in all the amendments again leaves me feeling rather sick. Have you any miracle cures?

Ian Tait.

Editor's Reply:
Load Quill and set up a page format with margins as you require them. Then use the merge command F3, 0 (for 'Other commands'), M (for 'Merge'), and then the drive reference and your lost file name followed by ENTER.

Quill will merge your file into the blank format up to the point where the data corruption occurs. You will get the diagnostic 'merge failed' but with luck you should then have in RAM a sizeable portion – some-times all – of your lost file.

Dial directory

I am compiling a directory of QL users who are modem owners, to facilitate the interchange of programs, ideas and hints, and generally to increase the technical competence of QL owners. I would be grateful if you could mention this and stress that there is no commercial interest.

If any of your readers own a QL and a modem – of any description – could they please send me the following details if they would like to be included in the directory:

Modem make and speeds available. Modem software make and a brief description of the facilities. Full telephone number, including area code. Postal address. Interests in computing, e.g., business, machine code, languages, utilities, games. Specialities, subjects in computing with which others could be helped. Any other pertinent facts, such as membership of IQLUG, Prestel and bulletin boards; auto dial/answer boards fitted; age if under 18.

If they could also include a Microdrive cartridge and a stamped self-addressed envelope, when I have received a few people's details I can send the first version of the directory to all those included in it.

Why should we have to subscribe to Prestel when there are plenty of people with modems and plenty of things to say to fellow QL owners?

Michael Gottlieb,
22 Gibbs Green,
Edgware,
Middlesex.

Thermal hardware

Recently I bought a QL from Dixons of Taunton. Included in the package was a serial 8056 compact printer.

I have since encountered a problem. No-one sells the thermal paper used by the printer Could you please make enquiries, as this seems a ridiculous state of affairs.

J. Parsons,
Taunton.

Printer copies

I write in response to the letter from P. Johnson in the April edition.

First I took the opportunity of buying the CGP-115 printer at the reduced price in the hope that it would be compatible with my QL. To my relief, it is not only compatible but very useful and is now an invaluable part of my QL equipment.

I have the full operating manual, a copy of which I will happily send to Johnson for a small contribution to cover photocopying and postage, if he will send me his address.

Second, I would like to say how much I enjoy your magazine. With its useful reviews and informative articles, I look forward to it each month. The recent Diary of a QL user was interesting and very funny. It makes a pleasant change to find such humour in a user magazine.

The Progs section offers some high-quality user programs, although they are not always as infallible as the editor claims, e.g., in *Qthello QL User* – August, 1985, line 1730 should obviously read:

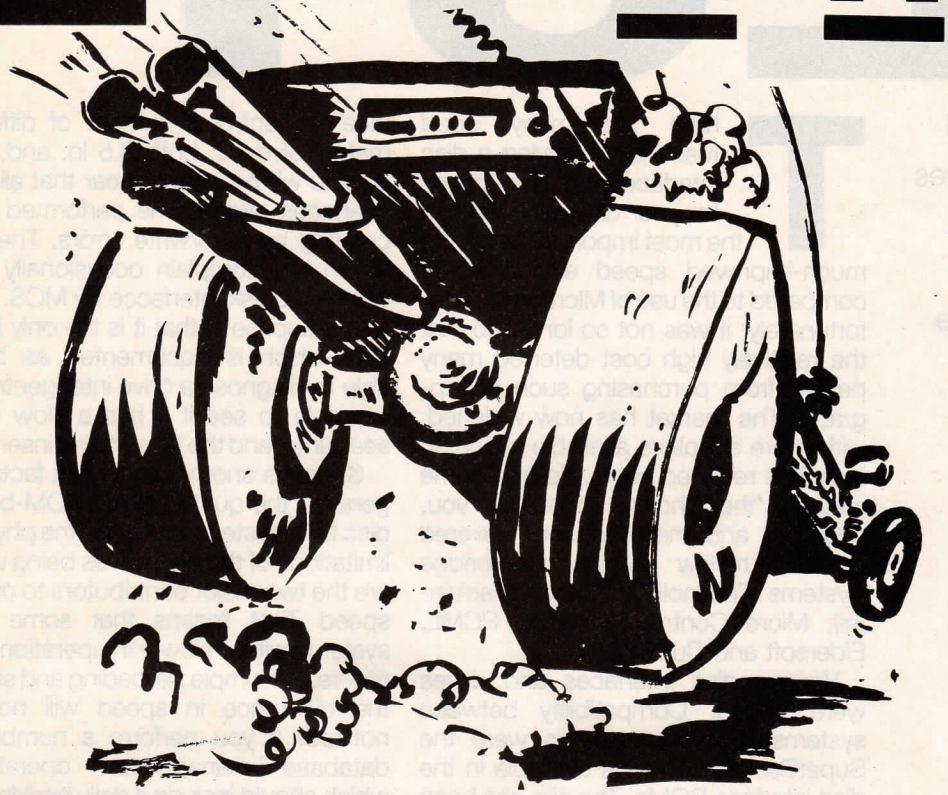
IF (x=1 OR x=8) AND (y=1 OR y=8) . . .

as x cannot hold values of and 8 simultaneously and nor can y. Still, the mistakes are few and far between and only go to show that very few people are perfect.

Editor's Reply: This is one of the many letters, programs and manuals we received in response to Mr. Johnson's letter the April issue. In view of the amount of interest shown in the CGP-115 printer/plotter, we hope to include a full review in the July issue.

We would be the first to admit that gremlins have occasionally crept into The Progs. Hopefully, as you suggest, they have been few and far between. You may have noticed we have tried to improve matters by standardising the size of printed listings and we will continue our endeavours to ensure programs are bug-free.

CHANNEL



The Whole Hog

I bought my QL in April, 1985. Abacus did not clone and had to be replaced. My machine was for the most part used for writing reports, for which it was reasonably satisfactory but why did it keep crashing? Sometimes it denied that a Microdrive existed, usually MDV2. Sometimes it even started accessing both Microdrives at once. Even with such defects it was used regularly at work until July.

Then followed a fallow period when I could not use the machine because the printer I bought refused to work even after repair. After the repair of both QL and the purchase of a new printer, I was in business. It was at that time I decided that additional memory and some kind of RAM disc driver was needed. The whirring Microdrive, after writing 2,000 words, was annoying.

I went the whole hog in January by buying 512K additional memory. At the Which Computer? Show I picked up a PCML plug in ROM £22.94 inc. VAT – and a Bowthorpe Spike Protector – show price £7, usually £14. My QL now has 640K and a ROM with RAM disc, spooler and multi-tasking commands and, of course, is protected by the spike suppressor. That transforms the QL from being just another boring micro into a proper workstation. I can now leave my micro on overnight with less fear of it crashing. I have more confidence in the machine.

My ideal set up would be: QL (JS ROM), 512K add-on RAM (PCLM), ROM toolkit (PCLM), RAM disk spooler, multi-task; green screen monitor (Citadel 101ql); dot matrix printer with NLQ – Centronics GLP.

Problems I envisage arising in the near future will be in using Metacomco C which needs a ROM plugged in to compile. Perhaps getting an EPROM expansion board might circumvent this problem. Micro Enterprises claims to sell one, but at £69.95. Will I just be able to set up the board and put the ROMs in any socket or will I need special ROMs with the correct starting addresses?

My experience leads me to ask why cannot Sinclair provide an upgraded QL – 640K with a bigger operating system ROM? It might be interesting to do a review of such a system comparing it to other micros.

Is it possible to replace the Sinclair ROM (48K) with a larger ROM? Perhaps Sinclair has given up on the QL?

P.E. Sutton,
Nottingham.

Taxing Problem

I recently purchased a small business system but I find myself in the predicament of not knowing which software to buy to suit the type of application I want. The system is a QL type JM with Philips amber monitor and Mannesman-Tally 85 with IBM/FX80 mode available. The software is required to help me run a small petrol forecourt and a small shop.

I need a well user-defined package which will enable me to replace my rather expensive accountant and still be able to satisfy the Inland Revenue at the end of the year; to work out the necessary VAT calculations and the format to satisfy the VAT man; a small interactive database which will help me to control the small amount of stock I handle in the shop.

All the advert sement sections I look at in the magazine for a package which might seem to fit my requirements appear to be far too sophisticated. I hope that you might be able to offer some advice which might point me in the proper direction.

B.H. Jones,
Bristol.

Editor's Reply: I would have thought that any of the accounting packages available, such as QL Cash Trader from Quest or the Sagesoft Integrated Accounts, would suit your requirements.

So far as software being too sophisticated is concerned, surely it is better to have a system which caters more than adequately for your requirements, rather than limit yourself to something which your business may outgrow in time. If you really do not want to buy commercial software, the only other option would be to adapt the Psion packages to your specific needs. Archive is eminently-suited to the type of database application you describe and, with a little effort on your part, a simple VAT accounts program could be implemented on Abacus.

Software wanted

Can anybody help? We are a registered charity providing hostel accommodation for people with mental health problems who are unable to cope with living on their own in the community.

We are fortunate recently to have acquired a QL and would like to use it to record our weekly rent returns and also our petty cash transactions.

Our problem is that we have nobody with sufficient understanding of the QL to write a program to meet our needs, nor do we have sufficient funds to be able to buy any of the software available. So we are appealing to readers for help. Is there someone who would be willing to write a program specifically for our rent returns and/or petty cash, or perhaps someone may have some software they no longer use? I might add that it needs to be on Micro drive.

N.C. Cullyer,
The Parkview Society Ltd,
15 Castle Road,
Torquay, Devon.

TEST

The addition of a RAM expansion and disc drives can transform your QL into a powerful workstation. Colin Opie compares six of the systems currenty available.

REVIEW

There are many good reasons for buying a disc interface and disc drives for your QL, with perhaps the most important being the much-improved speed and reliability compared to the use of Microdrives. Unfortunately, it was not so long ago that the relatively high cost deterred many people from purchasing such an upgrade. The market has now widened, with more suppliers available which, in turn, has reduced costs. To give some idea of the choices open to you, suppliers and manufacturers covered by this review include Cambridge Systems Technology, Sandy (Farmintel), Micro Control Systems), PCML, Eidersoft and Cumana.

Various disc interfaces and drives were tested. Compatibility between systems was checked, as were the SuperBasic extensions available in the disc interface ROMs. The aim has been to guide you in your choice of upgrade, which will depend on your requirements, while enabling you to obtain as much value from your hard-earned cash as possible.

There are so many makes of disc drive that compatibility between systems becomes important. Contrary to general belief, and sincere efforts on the part of manufacturers, total compatibility is not always available, even with discs.

Problems generally arise when a disc interface has been designed to work efficiently and safely with one particular type of disc drive. Older-style drives which users may be able to obtain very cheaply, or may already own, will not always prove to be totally acceptable to the interface.

Of course, that is not really a problem when all you are doing is choosing your new disc upgrade as a complete package. If, for example, you buy a 3.5 in. disc drive, any software you buy will either be on Microdrive – so that you are always copying to your own drive – or on a 3.5 in. disc. Likewise with 5.25 in. disc systems. None of the interfaces tested produced errors when used with the drives normally recommended for them by the respective suppliers, or when used with 3.5 in. drives.

The only users who need to be a little careful are those who want a disc interface to control a number of different makes of drive, both 3.5 in. and 5.25 in. You will be glad to hear that all disc interfaces except one performed well, creating no read/write errors. The one which did complain occasionally was the Memodisk interfacce by MCS. That was a suprise in that it is the only interface which is documented as being able to diagnose a drive intelligently, for example to see if it has a slow track seek time, and the type of disc inserted.

Speed is another important factor. In general, the quality of the ROM-based disc filing system code, and the physical limitations of the disc drives being used, are the two major contributors to overall speed That means that some disc systems will be slower in operation than others. For simple file loading and saving the difference in speed will not be noticed. If you perform a number of database management operations, which should include a daily backing-up of discs, you may as well be working with the fastest drives possible. Continuous read/write tests using 3.5 in. disc drives revealed that the PCML interface was the fastest and that the MCS Memodisk was the slowest. The difference in speed was around 15 percent. That means that if a continuous disc operation took seven minutes to complete using the fast interface, it would take eight minutes to complete using the slow interface. It is for individual users to decide whether the speed factor is important when making a choice. If all you are doing is performing normal Psion program operations and SuperBasic program loading and saving, you will not really notice the difference.

All disc interfaces for the QL have a ROM containing the disc filing system code and as many utilities as can be crammed in. One of these utilities provides the basis for being able to perform direct sector reading and writing. That feature is an important one if you want to purchase and use any kind of disc system toolkit, such as that produced by Digital Precision – see Of Disks & Drives II in the March, 86 edition.
of the RAM-disc if you switch off the QL or if the QL locks up for the same reason clock display. In essence, you obtain most, if not all, of the extensions supplied by the Sinclair QL Toolkit, but

DRIVE

not the QL Toolkit II by Tony Tebby, marketed by Care Electronics.

The interfaces by CST, PCML – and hence Eidersoft – Farmintel (Sandy), Silicon Express and Cumana all contain around 35 to 40 extensions to SuperBasic. The interface reviewed which did not contain much – only seven extensions – and did not support direct sector reading and writing – was the Memodisk by MCS. The Silicon Express interface will not read single-density discs.

It is common practice now for disc interfaces to contain some kind of RAM upgrade, usually either 256K or 512K The RAM upgrade exists either on th same boad as the interface, or as separate board between the QL and th disc interface board. In fact, or Cumana which limits itself purely to dis interfaces. A pseudo-device normally associates itself with disc plus RAM upgrades is the RAM-disc. A RAM-disc is created by formatting the device 'raml_', or 'ram2_' and the like. Its size is user-defined in terms of the number of sectors it is to have, each sector containing 512 bytes. For example, the command 'FORMAT raml_256' will create a RAM-disc with a total capacity of 256 sectors – 128 kilobytes of storage – more than sufficient to store the entire contents of a single Microdrive cartridge. Clearly there must be a 128K of RAM available for that to happen. If you buy a disc interface with 256K of extra RAM, only half of that will be used by the RAM-disc in the example.

The advantage of RAM-discs is that they are very fast for loading and saving operations. The disadvantage, of course, that you will lose the contents of the RAM-disc if you switch the QL or if the QL locks up for the same reason and you have to re-set it. You must make sure you have the contents of a RAM-disc on a disc or Microdrive before either of those things occur.

Another device, or utility, commonly supported in disc interfaces with extra RAM, is the spooler. A spooler is really a program which acts as a printer buffer. Instead of sending output to a printer directly, the output is fed through the spooler. The spooler sets aside a block of RAM for storing or buffering the text and then controls the sending of that text to the printer.

The advantage is that once the spooler has taken over, control returns to the user. In other words, you do not have to wait until the document is printed before you can continue to use the QL for other work. The saving in time, especially for long documents to a letter-quality printer, can be very beneficial.

Once again, all but one of the interfaces which provide for extra RAM also support RAM-discs and a spooler. By now you may be able to guess which is the odd one out but in case you cannot it is the Memodisk by MCL.

Two of the disc interfaces reviewed,

MCS Memocase. Poor Value?

the Sandy by Farmintel and the Memodisk by MCS, also contained parallel printer ports with the supporting SuperBasic extension 'PAR_USE' in the ROM. That can be a useful little extra but only if you have not circumvented the problem of interfacing a parallel printer to the QL.

The Memodisk uses a 6821 PIA chip to provide the parallel printer port, which for the technically-minded means that the interface could be re-programmed to act as a parallel input port. That is possible as no buffering exists between the PIA and the outside world.

For the majority of users that facility

TEST DRIVE

is about as useful as a radio without a battery, because no SuperBasic extension has been provided to allow them to achieve it. You would have to be very confident about machine code programming, have a reasonable knowledge of the 6821 PIA, and ensure that you did not upset port A of the chip, as that is used within the disc interface. The facility therefore seems to be more of a sales gimmick than something which most owners could utilise.

The PCML, SANDY, CST, Cumana and MCS boards all protrude from the end of the QL by the obligatory 6cm. as dictated by the matching black cowling. The Silcon Express interface rests completely inside the end of the QL.

All except the Sandy interface do the most sensible thing and keep the power regulator heatsink on the outside – ventilated – side of the board. Having said that, the Sandy heatsink is neatly designed and the interface did not appear to suffer from overheating.

The prices available at the time of going to press are shown in figure one. PCML prices are not shown because their interfaces are available more cheaply through other suppliers – see advertisements in this issue. Eidersoft prices seem high but they include a PCML interface, 3.5 in. disks, a mouse, Ice, ArtIce and utilities. Its 256K extra RAM option also includes the Choice multi-tasker software. Eidersoft will also supply a QRAM 256K RAM module which rests inside the QL if you want a full 512K upgrade from the company. The memory upgrades from Silicon Express also fit inside the QL and not on the disc interface board. Viglen markets the MCS Memodisk interface and disc drives. Prices quoted are all inclusive.

Which system you choose will depend mainly on your requirements. Certainly the MCS Memodisk interface is out of the running, both in terms of price and in terms of the facilities offered.

In general, the CST options will give you the little extra over those from Silicon Express. That is because the latter does not support single-density discs and its 512K memory upgrade is just that it is not an additional 512K.

If you definitely weant a parallel printer port you might prefer a Farmintel Sandy interface plus drives. The Farmintel options would be marginally more expensive than the cost of, say, an equivalent CST system plus the cost of a good serial-parallel convertor module – like the one from Care Electronics – but the result arguably would be more pleasing to the eye, tidier, and would still leave both the serial ports free.

If the use of a mouse appeals, the Eidersoft packages are worth considering. The software which accompanies them is very well produced and ArtIce with a mouse is delightful. If you opt for the basic system with no extra RAM, or the system with 256K of RAM, you are likely to save money compared to buying things separately. The 512K RAM system is not recommended, as it would be much better to buy, say, a CST or Farmintel system and then buy the other bits and pieces from Eidersoft.

So, for between £200 and £450 you can upgrade your QL to discs. Within that range the systems from CST, Silicon Express and Farmintel provide for the easiest ways to upgrade should you wish to start small and grow later. Of course, if you are the big-spender type you could choose a CST Winchester system – hard discs – which starts at around £1,150 for a 20Mb version which includes a single floppy drive.

FIGURE 1 – PRICE GUIDE

	Disk Interface	Interface +256K	Interface +512K	Interface + 1 disc	Interface + 2 discs	Interface +256K + 2 discs	Interface + 512K + 2 discs
Cumana	£79.90	—	—	£219.85	£321.40	—	—
CST	£79.95	—	£219.90	—	£275.00	—	£405.00
Silicon Express	£113.85	—	£238.85	£199.00	£170.00	—	£395.00
MCS	—	£199.00	£299.00	—	—	£408.00	£498.00
Farmintel	£135.00	£214.00	£249.00	£235.00	£335.00	£414.00	£449.00
Eidersoft	—	—	—	—	£399.00	£499.00	£594.00

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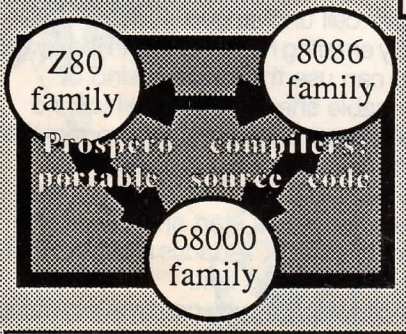

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Of the four applications packages supplied with the QL, the Abacus spreadsheet in my opinion is the most impressive and useful. Compared to other spreadsheet programs such as VisiCalc, and SuperCalc I, II and III, it is easier to use and more powerful. This short series examines the ways Abacus can be used for a wide range of calculations and information recording. Although spreadsheets usually are thought of as nothing more than a way of keeping balance sheets or other simple financial operations, in practice they are ideal for use in education, engineering, statistics and all branches of mathematics. They can be used to keep a telephone directory, to organise events, to solve equations, to demonstrate how something is worked out and to play games.

In the first part we look at how to go about creating a simple spreadsheet for a traditional financial application.

A new idea

The idea of a spreadsheet has its origins long before computers were invented with the use of specially-ruled paper, complete with headings, to make accounting easier. In that form the spreadsheet left the user to do the arithmetic needed to fill in entries such as "SUB TOTAL =" and the only advantages were standardisation and ready-made organisation. In the late 1970s with the personal computer revolution in full swing, two programmers, Dan Bricklin and Bob Franckston, evolved the brilliant idea of the electronic spreadsheet which, would provide a form to allow you to input data and would also work out the arithmetic for you.

That single, simple idea of combining the spreadsheet layout with the calculating power of a computer produced a revolution of its own and overnight everyone was producing or using spreadsheets. Things have quietened a little since those early days and now there is a tendency to think that spreadsheets are such obvious pieces of software that they did not need inventing. All I can say is that in the days before the spreadsheet revolution there was nothing obvious about how useful they would be.

One of the problems with how impressed everyone was about spreadsheets is that they tended to be used for everything, regardless of whether it was a suitable application or not. There are applications better handled by a word processor or a database and part of becoming expert in the use of Abacus is knowing when it needs help. The use of Abacus with Quill, Archive and Easel to produce a complete solution will be described in a later article.

Getting started

The difficulty with learning to use any reasonably useful piece of software is that it is likely to have a range of commands which includes something for every possibility. In practice, most of those commands are used infrequently and the day-to-day use of the software centres on a few important commands. With that in mind, this month's Abacus Art looks at the basic principles of using a spreadsheet and then explains the steps in constructing a simple spreadsheet.

All you have to do to get Abacus running is to have a cartridge containing a copy of the Abacus master in Microdrive 1 when you switch on or re-set the machine. Alternatively, you can type LRUN MDV1_BOOT which will load and run a SuperBasic program which sets up the QL and then runs Abacus. The standard BOOT program can be modified to advantage, as we will see later.

What you see on the screen depends on whether you are using a monitor or a TV set. By default, the TV display is only 64 characters wide but the monitor display is a full 80 characters to a line. You can change the Abacus display mode at any time to 40, 64 or 80 characters per line by use of the Design command – press F3, then D, then D again and then one of 8, 6 or 4 for 80, 64 or 40 characters to a line respectively.

Re-usable Paper

The way Abacus is displayed is fairly irrelevant to the way it is used. The main part of the display is a grid of cells, like a piece of paper ruled into rows and columns. The rows are numbered 1 to 255 and the columns A to Z and then AA, AB and so on to BL. A cell is referred to by giving its column letter and row number. Thus the cell in the top left-hand corner is A1 and the one in the bottom right-hand one is BL255. Much like the ruled paper the display represents, it is what you can put into the cells which makes the spreadsheet useful.

At any time one of the cells is special in that it contains the cursor; that is the active cell and its contents can be changed by typing on the keyboard. As you might expect, the cursor can be moved round the spreadsheet, using the arrow keys alongside the space bar, and so any cell can be made the active cell. If you want to move the cursor directly to a cell without having to move it through all the intermediate positions, you can press F5 and a cell reference and jump straight there.

Most people find it easier to press the arrow keys until they succeed in moving the cursor where they want it. The only exception is that pressing F5 followed by ENTER takes the cursor to cell A1 and that acts as a kind of HOME command.

Abacus is a remarkably versatile program capable of many diverse applications. Mike James introduces our series on getting the most from the Psion spreadsheet.

When you have the idea of moving the cursor it is time to begin entering data into cells. There are three types of entry you can make to any cell – numeric data, text data and formulae. For example, if you position the cursor at A1 and type 100 the figure 100 appears on the data entry line at the bottom of the screen. That can be edited using the cursor keys in normal SuperBasic fashion, that is:

—>	**move cursor right**
<—	**move cursor left**
V	**move cursor to far right**
^	**move cursor to far left**
CTRL <—	**delete character to the left of cursor**
CTRL —>	**delete character under cursor**

Notice it implies that once you have started entering something to a cell you lose control over the position of the large cursor marking the active cell. You can regain control over it by pressing ENTER, which transfers what you have typed from the display line to the active cell, or by pressing ESC, which erases what you have typed and leaves the active cell unchanged.

By entering numeric data in that way you can use the QL as a kind of re-usable sheet of paper which, no matter how many times you correct the data, still looks neat and tidy. In addition, you can include titles using text data. If you start an entry with a quotation mark " Abacus assumes that you are entering text.

Following that you can type any string of characters you wish and they will be entered into the active cell as a title. Once you have started a text entry the only way you can change your mind is to press the ESC key, because Abacus will not let you delete the initial quotation mark. If the text you type is too long to display in the column width, it will spill over into the adjacent columns so long as the cells it covers are empty.

THE ABACUS ART

An empty cell is one which has not been used to store anything and that is different from a cell which contains zero, " " (a blank) or "" (the null string). If the adjacent cells are not blank, the text is truncated to fit the space available. It is important to notice that although text may appear to be in more than one cell because it spills over, it is stored only in the cell in which it was entered. In practice, the spilling-over of text is used only for headings and single-cell labels, because it is better to adjust the size of individual columns to be enough to take their intended entries. To make sure you know what is stored in a cell the bottom line of the display always shows the complete contents of the active cell.

Formulae and functions

It is the third type of cell entry, formulae, which makes the spreadsheet a really powerful tool. A formula is a piece of arithmetic which can include cell references. For example, if you type 100 in A1 and 200 in A2, then A1+A2 in A3, then A3 will show the result of that calculation, i.e., 300. No matter how often you change the entries in A1 and A2, A3 will always show their sum. Note that cell A3 appears in the spreadsheet as if it contained a number but when you move the cursor over the contents line, at the bottom of the display, shows that it contains a formula.

The use of formulae to create a kind of 'active' piece of paper is the real key to the power and usefulness of spreadsheets and much of the remainder of this series will look at the way formulae can be created to solve all kinds of problems. In particular, we will examine the range of functions which can be used.

Functions extend the range of things it is possible to do with spreadsheets. For example, if you were asked to write a spreadsheet which found the sum of a column of 10 numbers, the only way you could do it without a function is to write A1+A2+A3+A4+A5+A6+A7+A8+A9+A10 into a cell and that clearly would be a difficult method to extend to the sum of 100 numbers.

Fortunately, Abacus provides the SUM function which will work out the sum of any partial column or partial row. The simplest way to specify a partial row or column is to reference the first and last cell so, for example, SUM(A1:A10) will add the contents of all the cells in column A from A1 to A10. In the same way SUM(A1:D1) will add the contents of the cells in row 1 from A1 to D1.

Giving the first and last cell in a partial row or column is called a range refer-

ence and many functions can perform operations on groups of cells specified in that way. As well as partial rows and columns, many Abacus functions will operate on a block of cells specified by giving the cell in the top left-hand corner and in the bottom right-hand corner. For example, the range reference A1:C10 defines a block of cells three columns wide and 10 rows deep.

Commands

Although entering data and formulae are the major occupation of any spreadsheet user, the need to modify some aspect of the spreadsheet often occurs. You might discover that you need an extra column in a spreadsheet or need to delete a column. Such operations are achieved by using a range of special Abacus commands. You can see a complete list of commands at the top of the screen by pressing the F3 key. Selecting one of the commands is a matter of typing the first letter of its name and then answering the questions it asks. If you want to save a spreadsheet, press F3 followed by S and then type the filename by which you want the spreadsheet to be called.

Although the commands are all reasonably easy to understand, knowing how and when to use them can be a different matter. Rather than going through each command in turn and explaining its action, the rest of the series will look at the way commands are used during the construction of real spreadsheets.

Spreadsheet programming?

There are two attitudes to the use of spreadsheets. The first regards a spreadsheet program as a useful interactive tool for recording data and working things out. In that case the person typing data and formulae is one and the same. The alternative view is that a spreadsheet complete with titles and formulae is prepared for a relatively unskilled person to use. That second attitude is akin to thinking of the process of spreadsheet creation as something like programming.

It is, in my opinion, the best way to go about things, because it tends to save time. Instead of having to construct a special spreadsheet for each set of data it is much better to spend a little more time initially and produce a better-quality spreadsheet which can be used time and again with different data. That does not mean that I do not occasionally use Abacus to add the odd column of figures or do a one-off calculation; it is just that if I identify anything I am likely to do more than once I try to construct a high-quality spreadsheet I can use again.

As a way of explaining how to construct a re-usable spreadsheet, consider the problem of keeping track of purchase invoices for preparing quarterly VAT returns. Essentially the information you have to record is the date of the purchase, the supplier, a brief description of the item, its VAT rate – i.e., 0% or 15% – its price including VAT (its gross price), its price excluding VAT (its nett price) and the amount of VAT paid. The object of the exercise is to vind the totals of gross price, nett price and VAT.

The first stage in producing this simple spreadsheet is to give appropriate titles to the seven columns – A to G – required, in row 3, say. Second, we should arrange for it to provide the answers needed. If we assume around 20 purchase invoices per quarter, it is reasonable to enter SUM(E1:E24) in E25, SUM(F1:F24) in F25 and SUM(G1:G24) in G25. At that point the best thing to do is to enter a line of test data, such as:

Date	Supplier	Item	VAT-Rate	Gross-Price	Nett-Price	VAT
1 Jan	F Bloggs	QL Computer	0.15	228.85	199	29.85

The first thing which becomes apparent is that some of the columns are of incorrect size – far too much space for "Date" and far too little space for "Item" and "Supplier". Column widths can be changed by using the Grid command. Press F3 then G and then select the Width option by typing W. Following that you can specify the width of any number of columns. Using that command the columns are set to the following widths:

Date	Supplier	Item	VAT-Rate	Gross-Price	Nett-Price	VAT
6	20	20	4	8	8	8

If any of those column widths proves incorrect it is easy enough to use the Grid command to change them at a later date. The next thing to do is to tidy the appearance of the numbers in the final four columns. That can be done by using the Units command. Columns D, E and F all need to be displayed in money format – press F3, U, ENTER, M, ENTER and E1:G25 – and column D needs to be displayed in Percentage format – press F3, U, ENTER, P,0 and D1:D25.

Next the working part of the spreadsheet, the formulae to calculate the VAT and NETT given the GROSS and the VAT RATE. It is not difficult to work out that:

$$\text{VAT} = \frac{\text{GROSS} \star \text{VAT RATE}}{(1+\text{VAT RATE})}$$

and

$$\text{NET} = \text{GROSS} - \text{VAT}$$

The first of those formulae can be entered into all the cells of column G by moving the cursor over G5, typing col=E5*d5/(1+d5) ENTER, then in response to the question FROM type 5 ENTER and in response to TO type 24 ENTER. The col= and row= commands are a quick and convenient way of setting all the cells in a partial column or row to a single entry. This process is a little more complicated than it appears at first but more of this next month.

In the same way the NETT column can be calculated automatically by moving the cursor to F5 and typing col=e5–g5 and then answering the questions to produce FROM 5 TO 24. The final touch is to fill-in a default value for the VAT RATE by entering .15 into all the partial column D5:D24. Following that, all the units have to re-specified to make column D show as a percentage and columns E, F and G show as money.

As the spreadsheet stands, it can be used to record purchase invoices by typing-in the date, supplier, item and the gross price. The nett price and VAT will be worked out automatically for each entry. If an item is zero-rated for VAT, it is also necessary to enter a 0 in the VAT RATE column but if that is done the VAT and NETT prices are still worked out correctly. Then add a few ruled lines, by entering rept("–",80) into A24 and A26, and few more titles. To make the ruled line appear in all of row 24 you have to use the Rubout command to erase the entries in D24:G24.

Improvements?

Even though this VAT invoice spreadsheet looks as if it is finished, it still leaves much to be desired. Some of the problems we can do something about by altering the spreadsheet; some have to be solved by careful use. For example, as the spreadsheet stands you will find that after you enter the Gross price the VAT is calculated correctly but the Nett price is shown incorrectly until you enter the next Gross price.

That is because the entire spreadsheet is re-calculated each time you make an entry in row order. First the value of A1 is calculated, then B1, then C1 and so on until row 1 is complete and then row 2 is calculated in the same way, then row 3 and so on until all the cells have been evaluated. With that order of calculation in mind you should be able to see why the Nett price is

	A	B	C	D	E	F	G
1			VAT — 1st Quarter				
2							
3	Date	Supplier	Item	VAT	Gross	Nett	VAT
4				Rate			
5	1 Jan	F. Bloggs	QL Computer	15%	£228.85	£199.00	£29.85
6	2 Jan	Acme Computers	Disks	15%	£10.00	£8.70	£1.30
7	10 Feb	GPO	Stamps	0%	£10.00	£10.00	£0.00
8	25 Feb	Local Shop	Batteries	15%	£4.60	£4.00	£0.60
9	26 Feb	Anytown Garage	Petrol	15%	£12.20	£10.61	£1.59
10	10 Mar	GPO	Stamps	0%	£3.60	£3.60	£0.00
11	20 Mar	Outmac	Printer Paper	15%	£36.00	£31.30	£4.70
12	31 Mar	Anytown Garage	Petrol	15%	£12.70	£11.04	£1.66
13				15%	£0.00	£0.00	£0.00
14				15%	£0.00	£0.00	£0.00
15				15%	£0.00	£0.00	£0.00
16				15%	£0.00	£0.00	£0.00
17				15%	£0.00	£0.00	£0.00
18				15%	£0.00	£0.00	£0.00
19				15%	£0.00	£0.00	£0.00
20				15%	£0.00	£0.00	£0.00
21				15%	£0.00	£0.00	£0.00
22				15%	£0.00	£0.00	£0.00
23				15%	£0.00	£0.00	£0.00
24	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -
25	Totals =				£317.95	£278.25	£39.70
26	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -

incorrect the first time it is calculated.

As Nett price is in column F it is calculated before the VAT in column G but its formula, NETT=GROSS=VAT, involves the VAT value which at that stage is not known. The next time the spreadsheet is re-calculated, everything is satisfactory because the VAT on that Gross price is known. There are two solutions to the problem. You can alter the order of the NETT PRICE and VAT columns or you can use the Xecute command to re-calculate the spreadsheet until the values are shown correctly.

A more serious problem is that we do not always want to enter the Gross price and have Nett and VAT calculated. Sometimes we know the Nett price and want the Gross and VAT calculated. In other words, our ideal spreadsheet would permit the entry of a value in either the Gross price or Nett price columns and would work out the remaining columns automatically. That can be done and in a way that eliminates the order of calculation problem mentioned by using one of the many Abacus functions. Can you work out how? All will be revealed next month.

SOLUTIONS

The answer to April's encrypted enquiry. And, for those on the ball, another chance to win a year's subscription.

FIGURE 1

```
100 OQGQ_MS#3,SKD1_MKEM_SWAU
110 FXYMZP = 0
120 OCOEBV FSIKSWXZ
130 TR RCU(#3) JYWG YSEQ ANDFNRSU
140 OUXDD#3,NTNF
150 XV TZTL>96 VJA AGAS<123 VKIS
    IOIA=MSME-32
160 WU SYSK>64 UIZ ZFZR<91 UJHR
170 HNHZ = LRLD + BTUIVL
180 KYKAXR QAOIH
190 MK IOIA<91 DSQA SMYK JTHBA
200 ZFZR = DJDV - 26
210 JTK ZNZPMG FPDXW
220 ILDJQ AGR$(DJDV);
230 TLMAND = ZRSGTJ + 1
240 VDLY
250 KNFLS CIT$(FLFX);
260 LVM SQ
270 QAR GUGWTN XKACKOPR
280 FPTYL#3
```

FIGURE 2

```
100 OPEN_IN#3,mdv1_data_file
110 offset = 0
120 REPeat codeloop
130   IF EOF(#3) THEN EXIT codeloop
140   INPUT#3,char
150   IF char>96 AND char<123 THEN
      char=char-32
160   IF char>64 AND char<91 THEN
170       char = char + offset
180       REPeat range
190       IF char<91 THEN EXIT range
200       char = char - 26
210       END REPeat range
220       PRINT CHR$(char);
230       offset = offset + 1
240   ELSE
250       PRINT CHR$(char);
260   END IF
270 END REPeat codeloop
280 CLOSE#3
```

FIGURE 3

```
100 OPEN_IN#3,mdv1_data_file
110 offset = 0
120 REPeat codeloop
130     IF EOF(#3) THEN EXIT codeloop
140     char = CODE(INKEY$(#3))
150     IF char>96 AND char<123 THEN char=char-32
160     IF char>64 AND char<91 THEN
170   char = char - offset
180   REPeat range
190       IF char<91 THEN EXIT range
200       char = char - 26
210   END REPeat range
220   REPeat inc
230       IF char>64 THEN EXIT inc
240       char = char + 26
250   END REPeat inc
260   PRINT CHR$(char);
270   offset = offset + 1
280     ELSE
290     PRINT CHR$(char);
300     END IF
310 END REPeat codeloop
320 CLOSE#3
```

FIGURE 4

```
100 CLS : OPEN#11,ser1
110 n=0 : A = CODE("A") : Z = CODE("Z")
120 REPeat loop
130     c = CODE(INKEY$(-1))
140     IF c>=A AND c<=Z : c=c-n+26*(c-n<A) : n=n*(n<26)+1
150     PRINT#11,CHR$(c);
160     PRINT CHR$(c);
170 END REPeat loop : CLOSE#11
```

Feeling generous, I let you have life easy in the April issue, where you had to perform a simple decryption using an accidentally encrypted encrypter. Some readers found it so easy that they spent a few hours trying to find a further code within the decoded question. How culd they possibly think that I would play such a dastardly trick?

In case you didn't get it, the encoded question HPY PESE RQUYMKGSH EW EXGJNV BNET VKI XZHVMKCP DZ BYTJH BVRB? decoded to HOW MANY KILOBYTES OF MEMORY DOES THE STANDARD QL MICRO HAVE? to which I expected the answer '128K', though I was willing to accept all the entries telling me the result with all the other bits of ROM memory included.

The editor's random encryption device mixed all the entries, and finally decided on M. P. Slade of Fareham, Hampshire who receives a year's free subscription.

Most people spotted that it was a fairly simple ASCII-based substitution code, with the added complication of an incrementing offset. The original encrypted encryption program – figure one – should eventually prove to be the true program shown in figure two. This time, indentation has been used to show the true structure. There are many ways of spotting the encryption method. Particularly easy targets were the OPEN_IN statement in line 100 and the two PRINT statements in lines 220 and 250.

PUZZLE PAGE

Thus, where the first line –line 100 – should start with OPEN_IN, the 'O' is substituted correctly. Following this, the 'Q' is offset by one from the original 'P', then the 'G' is offset by two from the 'E', the 'Q' is three from 'N', and so on. Each time the loop was executed, offset was increased for the next letter. As I mentioned, it was based on the ASCII characters, therefore the REPEAT range loop was needed to ensure that the encrypted character was an upper-case letter. Any lower-case letters in the input were converted into upper-case prior to encoding, so it is not possible to decode them back to their original but only into upper-case.

I would like to thank R. A. Lang for his interesting letter and his deciphering program – figure three. It uses the same variable names as the encryption program, so it should be reasonably easy to follow. Two additions were necessary to use the program to decipher the encryption routine. First, INKEY$ has been used instead of INPUT, because the latter can deal only with representations of ASCII characters, each followed by a carriage return, as they are read from the Microdrive File – mdv1_data_file. Second, an extra REPEAT loop – REPeat inc – was necessary to convert back into the correct range.

Finally, before we move to the next problem, figure four shows a very short decryption program, sent by Thanos Stassinopoulos.

If this one does not keep the micros whirring and the brains addled, my name is not Quentis Lozenge. A few years ago, I visited a mathematician friend and was surprised to find him counting ball bearings. On enquiry, he told me that a colleague had given him this phenomenal number of objects, asking whether he could find any interesting relationships.

Leaving him to his tedious task, it was only recently I saw him again. He told me that after only a few years of counting, he had discovered that the total number of ball bearings was a palindromic number, with all the digits the same. Further, he realised quickly that he could use all the ball bearings to form two pyramids – he was a smart fellow. One of the pyramids was triangular, where each ball bearing rested on three others, and the other was square, with each ball bearing supported by four others.

He then told me that, by remarkable coincidence, the combined levels on the two pyramids was also a palindromic number.

Puzzling over this very unlikely situation, I asked my faithful QL to work on the problem. It told me quickly that a triangular pyramid of level six contains 56 ball bearings and a square pyramid of level five contains 55 ball bearings. That of course, gives a combined level of 11 (6+5) and a total number of 111 (56+55). Both those numbers are palindromic and the latter contains only the digit one, satisfying the requirements. That cannot be correct, I thought, knowing how long my friend had spent counting the box-full and asked the QL to find the next lowest number.

Knowing that each ball bearing is one centimetre in diameter, can you tell me the combined heights of the two pyramids, as measured from the floor to the top of the highest ball bearing? To the nearest centimetre will be satisfactory.

Two definitions may help. A palindrome is a number which reads exactly the same when reversed, such as 1356531 or 979. A triangular pyramid is a pyramid where each ball rests on three balls below it, then six, 10, and so on. A square pyramid is below it, then six, ten, and so on. A square pyramid is where each ball is supported by four balls on the next level. Thus, after one ball at the top, there will be four on the second level, nine on the third, and so on.

Remember that the level is the number of layers in each pyramid, not the height. When you add the levels, you should have a paladromic number. Adding the total number of ball bearings in both pyramids should give a palidrome, where all the digits are the same.

As usual, I shall be interested to see any elegant proofs or programs for this problem. When submitting programs, please remember that we have only limited space, so I will not be able to feature any lengthy solutions.

All entries must be written on the panel provided on this page. Any other form of entry will be disqualified.

Entries must be sent by post to:

Puzzle Page,
Sinclair QL World,
79-80 Petty France
London SW1H 9ED

to arrive no later than Friday, June 17, 1986. Please mark the envelope 'Puzzle Page'.

The winner will be the first correct entry drawn from the editor's fez. In the event that nobody submits the correct combined height, the winner will be the person with the nearest answer.

All entries will be judged by the Editor, whose decision is final and no correspondence will be entered into regarding the result.

ENTRY FORM

Combined height = _____ cm

Name: _____

Address: _____

_____

_____

SOFTWARE APPLICATIONS

"OF COURSE, THE MAIN PROBLEM IN LIFE IS THE COMPUTER"

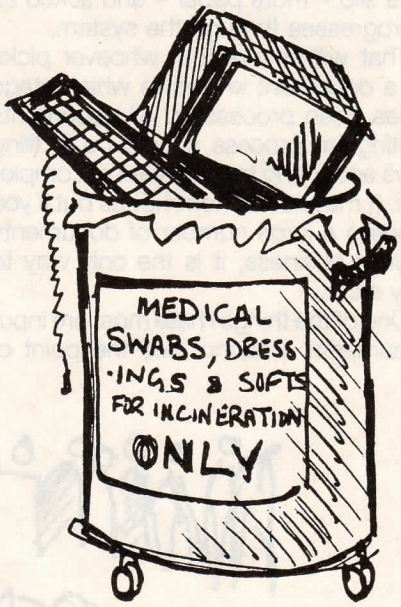
That profound statement: "Of course, the main problem in life is the computer," was overheard on the top deck of a bus and summarises many of the evils which have been inflicted on business people in the last 10 years or so. It is noteworthy that Sinclair intended to call his next computer Pandora and as those who have arts rather than science backgrounds know, when Pandora's Box was opened all the ills of mankind were released.

It is usually certain, however, that when the poor dumb computer is getting the blame, it is a dumb manager who is really responsible. Either the manager did insufficient homework before buying the equipment, or inadequate thought was given to specifying the system. Most likely is that the equipment and system are satisfactory; it is the the management of its day-to-day use which is at fault.

Medi QL

A team of doctors decided to buy a computer to help with the work in their office. Having bought the machine and tried to decipher the handbook which, as we all know, is always much more complex than medical text books, they very sensibly set to work to change their office system to accommodate the micro. Having sorted-out their manual office system they discovered they did not need the computer after all.

What a pity they did not consider exactly what the machine was capable of doing and what they wanted it to do before they started. If you are setting out on this road, or are at the beginning of the journey, here are some pointers from one who has passed this way before. After all, why should everyone have to make the same silly mistakes which I did?



What to expect

The microcomputer is both a very powerful and a very limited tool. It can handle large amounts of information, sort it, match it and print it out far faster than an office junior with a four-drawer filing cabinet, a foolscap pad and a pencil. It can be used to quantify existing business, analyse past business and anticipate future trends.

All the same, it is not very good for looking-up an individual record or at handling complex records with a large amount of text which needs constant editing. It also takes as long to key-in records to the database as it does to type them on to paper.

So you have to consider carefuly how you structure records to reduce input and how to manage input so that you have sufficient time to output something. It is very easy to expect far too much from one poor little machine.

A colleague said to me recently: "We want to write to 200 or so employers, so we thought we would put it on the word processor." I was glad someone was awakening to the fact that the machines were there to help and I asked when it was required. "About Tuesday, I would think," he replied, with no hint of sarcasm.

When I explained it would take at least half a day to key-in the information, since it had not already been put on the database, and that since the daisy-wheel printer produces only about 20 letters an hour it would take 10 hours to print his 200, he departed in the direction of the Gestetner, mumbling something about "wonders of modern technology."

I was glad that it was the same person who had vetoed my buying a 200-cps dot matrix machine with NLQ which could have done the job in one-third of the time.

There were, therefore, several important considerations to be made before deciding which office functions are worthy of computerisation.

Precisely what informtion you should hold on the computer; what not to hold and why; the way in which information will flow between manual system and the computer; what training you and any staff may need; who should be involved in reviewing the existing system and deciding future developments.

Not all those considerations will apply to the one-person business but as soon as it becomes a two-person business they certainly will.

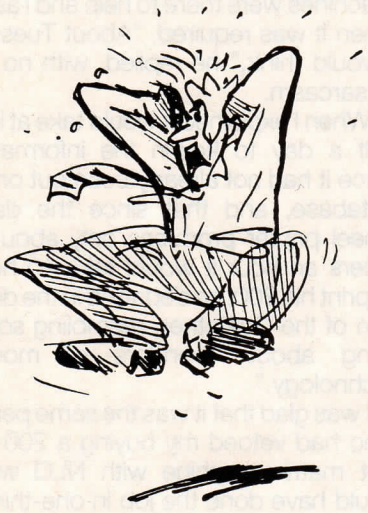
Database management

Unlike a manual system, all information stored on a computer must have a useful function so far as the computer system is concerned. That means it must be capable of being used to calculate, carry-out searches and sorts on data, produce meaningful reports or interact meaningfully with other computer systems. Above all, it must at least save you time and probably generate more business.

One big mistake which is commonly made is trying to get too much on to

the database. That generates so much input time that the owner does not have a quiet moment to get anything out. You must therefore justify your reasons for putting up information for every field you create. It is no use having fields of information you might need which may be called on so rarely that you cannot remember the last time you used it.

They all occupy valuable space on disc or Microdrive and, perhaps even more important, create unnecessary work which has to be paid for. The operator either has to waste time inputting data which is not being used or waste time skipping through the field to one which is important. Either way, you pay.



My computer department colleagues call me a volatile user, not only because I get hot under the collar from time to time, but because the data I use is constantly changing. This kind of data makes an ideal subject for a computer, since the editing facilities of the machine make it easy to keep up-to-date – but is does not just sit there and look cheerful.

The word processor sets up letters which link with the files to communicate with people. Sets of data from one file are matched with data sets on another to print-out lists. Volatility means usability as well as change. Records of past transactions,m immutable information which is not used interactively with other information and other such non-volatile data is best kept on old-fashioned card indices, in filing cabinets or brown paper parcels in the basement. They certainly have limited appeal to a computer system.

An office with a system mounted on one micro soon discovers it has a built-in bottleneck. I call it the 'funnel effect', since you have several people pouring in information but only one person operating the machine which will only regurgitate its data at the speed of the printer in use.

Because the introduction of the computer effectively mechanises the office, administration becomes more a matter of production management. Since the machine is doing the procesing, what is now required is a well-organised assembly line to ensure that documents and information are processed at the appropriate time and in the appropriate orders.

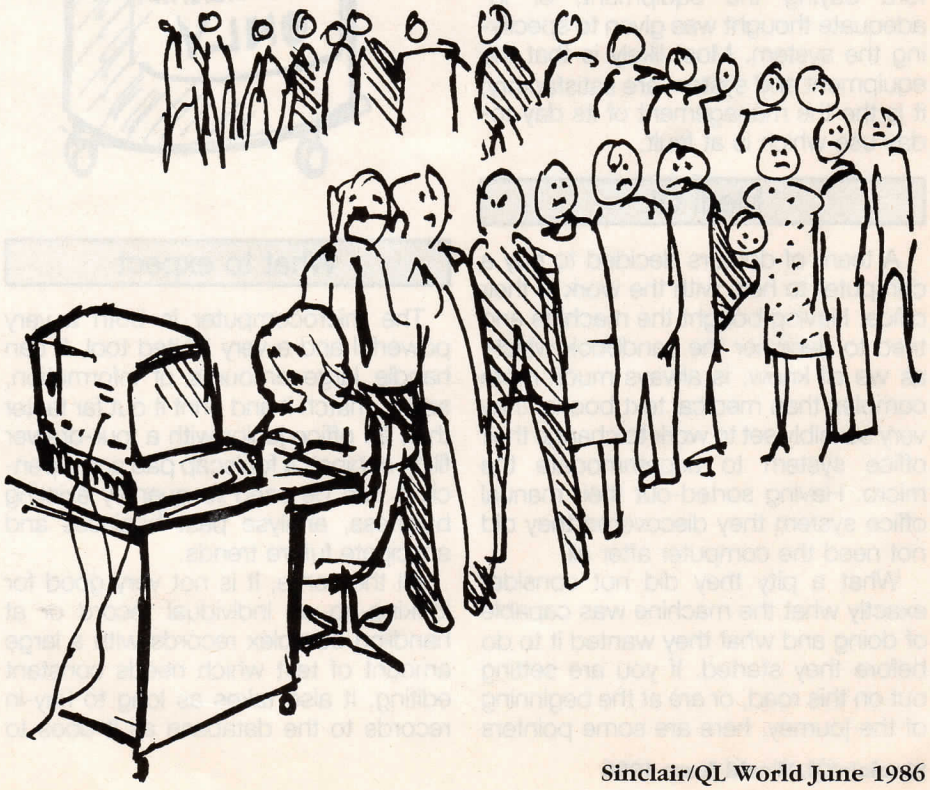
Passing paperwork

It is very frustrating to discover that the latest update has been over-written by earlier data because no-one thought to ensure that documents were handled in order. A good computer peripheral to use is a battery of filing trays. Each process through which a document has to pass should be printed on a slip – more paper – and ticked as it progresses through the system.

That will ensure that whoever picks up a document knows to which stage it has been processed. All documents waiting for process should be in filing trays according to their state of completion. It may sound horrendous but if you process a large number of documents in your business, it is the only way to stay sane.

One of the things I hate most are input documents. I cannot see the point of having to write things on a special form to have information input to a computer. I would rather re-design any documents I have both to collect the information and function as input documentation, if it is needed at all. If necessary, it would be even more useful to design the computer input round existing documents rather than create work. It seems to me that the term paperless office is to the computer today what the term wireless was to radio 30 years ago. I know I am fighting a losing battle – but I fight on.

Nothing disrupts the flow of input like people wanting to use the machine to look-up individual records. If you want to do that it is usually much easier to search a manual system than to find the appropriate discs, load the program, issue the search command and view the record. If you need only to get in-



formation from a record, by far the easiest way is to have a print-out of the files on the desk.

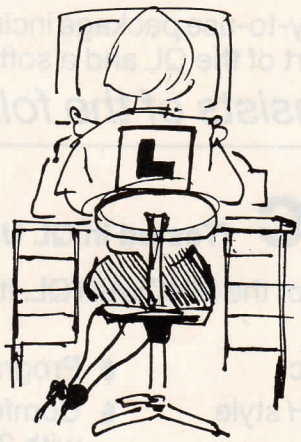
Many of the pitfalls are avoided when the computer is integrated properly into an office. They are most prevalent when the computer has been tacked on to an existing manual system. In general terms, an office micro must become the hub of the operation. It likes to be the centre of attention. Since, if used wisely, it will make light of mindless chores, leaving you to make money, it is better to ensure that all other systems relate to it well.

Peripheral people

Other systems, of course, includes you and any staff you have. Integrating the computer with people is much more difficult. The problem is that all life forms are territorial. They are happiest when they know where they are and what to expect. That is true of plants and animals but it is especially true of clerks. It is not a pretty sight to see a colleague struck with a sudden attack of technophobia.

It usually happens just after the first record has been saved to a file. The screen clears and the record has vanished from sight; as far as the technophobic is concerned, it has probably gone for ever. Helping people to realise that because they cannot see the record any more does not mean they have done something wrong sometimes needs the patience of Job.

Even so, by taking colleagues patiently step by step through the processes, confidence can be inspired. One of the best computer input clerks I know shook physically when I first introduced her to the machine.



Training others pre-supposes that the trainer is prepared adequately. Self-actualised business people seldom have the patience with themselves which they need. Anxiety to get the show on the road can encourage skimpy coverage of the necessary ground-work and result in frustration and even disaster. You have to do your homework, getting to know what the system can do, so that you can specify what you want it to do for you.

Many technical colleges are staging courses for business people, both in evening and day classes. The national Extension College, among others, can also provide useful correspondence courses on business computing. You might find a local QL User Group where you can receive help and advice. That will lay good foundation material for a happy business relationship with your computer.

If your business is dynamic, so will your computer system be. That means that whereas it is essential to get the system as correct as possible at the outset, a constant policy of review and revision needs to be maintained henceforward if you are to move with the times. Once you start on that path you will be surprised at what a useful tool a well-managed computer can be, but be vigilant. Once you lose control the machine will begin making demands on you. Good management will ensure that it pays its rent. Very good management could ensure that it pays yours as well.

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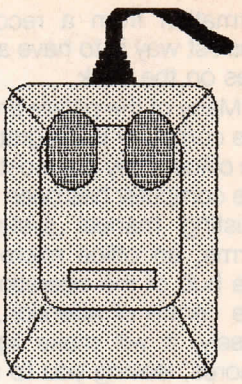

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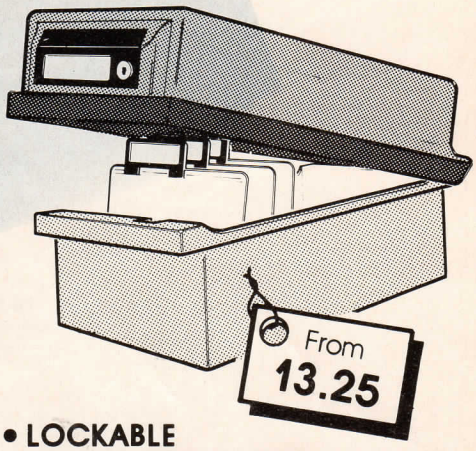

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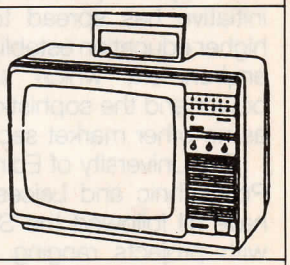

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Early last year Sinclair made a present of more than 500 QLs to Strathclyde University. Mary Sergeant assesses the machine's progress through Britain's higher education establishments.

When the Strathclyde Project was announced by Sinclair Research in January, 1985, it was not immediately obvious that the QL had found a niche which no other microcomputer then available could fill so neatly. The information that a Scottish university would like all its students have personal computers by the end of the decade, and that Sinclair had "generously gifted" the first 525 machines to that end, sounded more like a public relations exercise than a serious marketing opportunity.

Fifteen months later, however, Strathclyde is producing results and its initiative has spread to several other higher education establishments. It is an environment which appreciates the power and the sophistication of the QL as no other market sector has done.

The University of Edinburgh, Teeside Polytechnic and Leicester Polytechnic have all followed the Strathclyde lead, with projects ranging from electronic chip design to problem-solving and word processing. Each of the colleges anticipates an expansion of its individual schemes and, so far, the advantages of extensive use of micros have been found to outnumber the disadvantages.

The price is right

In one sense, the impetus of all the tertiary education projects involving the QL could as easily be maintained on other machines, with a similar specification. The 68000 processor, the memory, graphics capability and portability are none of them exclusive to the Sinclair micro but once price enters the calculation, the QL leaves the opposition standing. Realistically, students will never be in the position of affording, for example, an IBM PC, nor even one of its many clones, and although Amstrad systems are competitive in terms of price, they do not offer the same power or portability.

The underlying premise of the Strathclyde and other projects is that micro-computers can and should change the way in which subjects are taught at the higher levels, and that individual students, as well as the particular colleges, must have total access to the necessary hardware and software before the revolution can become effective.

When Strathclyde first went public with its plans, the project director, Professor James Alty, was quoted as saying: "The need is for a workstation – for students – capable of some standalone functions such as local filing, editing and program compilation, while at the same time capable of linking to the campus network for access to higher levels of computing."

> "When the students get hold of the machines and use them, I think most of them find the bad publicity was not deserved".

That has proved to be wholly possible. Dr Richard Kingslake, senior lecturer in the computer science department, has graduates reading for an MSc in information technology who plug their QLs regularly into the university's triple VAX 11/782 mainframe system and, having prepared documents or complex calculations on the QL at home, move files to and from the mainframe computer, very much as their work schedules dictate.

All first-year students who read computer science, whether as a main course or a subsidiary subject, have access to

UNIVERSITY CHALLENGE

a QL and are required to hand in all course work ready-printed, courtesy of Quill and the various printers available on campus. Electronics students have used the QL to study circuit design, employing simulator software written by a member of staff, and tutors and lecturers often take a QL into the lecture hall with them.

The two areas most concerned with the project are the schools of computer science and electronic science but many other departments are involved peripherally. The law department recently requested 30 micros, mainly for use in data storage and manipulation, and other faculties use the QL for relatively straightforward business procedures such as spreadsheet and word processing applications. The business school has a laboratory full of QLs and the modern languages department is involved in a somewhat abstruse use of micros, investigating the structure of Italian poetry. In all, at least half the departments in the university are involved to some extent and a fair percentage of the 7,000 student population is aware that the QL has arrived.

Into the nineties

Whether the end of the decade, i.e., in four years' time, is a realistic timescale for the aim of ensuring that everyone has a personal computer, as was intended originally, is a different matter, and whether all the personal computers will be QLs is as yet undetermined.

Kingslake likes the machine, and so do his students. "When the students get hold of the machines and use them, I think most of them find that the bad publicity was not deserved. I use a QL all the time and I would say the bad publicity was wrong."

The university, however, cannot afford to take chances. Much of the software developed in the last year at Strathclyde is not specific to the QL, although written on it. Most of the tailored programming has been restricted to short sub-routines which could easily be adapted for use on other micros.

Although "the QL is certainly one of a set of micros we would always consider," Kingslake emphasises that the university has to take into account the possibility that the QL may not always be available. "We would not want to be in such a state that we were hooked on.

As for his ideal machine, it should be relatively cheap, fairly portable and "it would be very pleasant if it could have an in-built screen." As someone with experience of the QL with both Microdrives and discs, he finds "Microdrives are much slower than discs and one tends to change the whole way one is working, so I think we would very much like it if we could have a computer with discs in the future." Yet Strathclyde is pleased with its QLs so far, having experienced only a three percent failure rate of machines, and only seven faulty Microdrive cartridges out of the 1,300 used to November, 1985.

Student software

As for tangible results, Strathclyde has produced prot >type software for its own and other colleges use, about which David Park of Sinclair says: "At last, we have software and operating procedures which we can sell across tertiary education round the world." Apart from the circuit design procedures for electronic engineering students, there are three major programs which may be available commercially before the end of the year."

The Strathclyde portfolio consists of three programs, *Filet, Reader* and *Examiner* which are likely to be of use to students in any discipline at any level. Filet was written in machine code and is designed to move files fast between the QL and a maniframe computer.

"The mainframe end of it is written deliberately to be general and it has a little extra frill on the side. We have made the QL act as a 4010 Tektronix graphics facility, so we can draw pictures on the QL running from a program on the mainframe. That is not much use, I must say, but it is rather a good little extra."

The other two programs permit manipulation of the text files taken from the mainframe by Filet. Reader operates much like an editor, except that, as with a printed book, the text cannot be modified. It can be annotated, as is usually done with a pencil in the margins of books, and although the main text will not be marked, the annotations can be saved and re-loaded when required by the student whose notes they are.

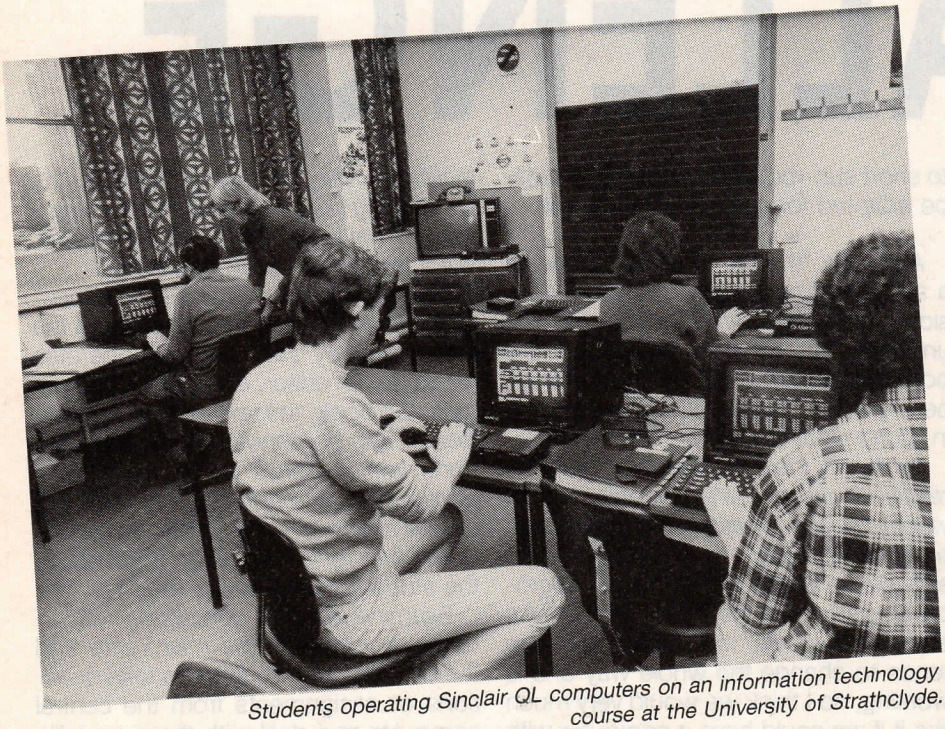
Examiner is again concerned with interaction between the mainframe and the QL, allowing students to take questions or assignments from the central computer and deal with them on a file which is fed back subsequently into the mainframe to be accessed by the relevant tutor.

> "We would not want to be in such a state that we were hooked on a machine we could not replace".

STEAM is more particularly computer-orientated. According to Sinclair Research, it stands for Strathclyde Teaching Electronic Automatic Machine. "Well, it might be," says Kingslake cautiously. "I invented the word STEAM because I thought a steam computer sounded fun and it obviously has the word Strathclyde on the front.

An Emulator for assembly and Machine code was one possibility but we haven't really defined exactly what it stands for. No matter, it is a powerful tool. It emulates a very simple computer, while demonstrating many facilities of more advanced computers, and the students learn a good deal about computing by using this emulator."

UNIVERSITY CHALLENGE



Students operating Sinclair QL computers on an information technology course at the University of Strathclyde.

Polytechnic projects

It is that kind of development which could help establish the QL as a recognised micro for higher education. If the proper kind of software becomes available in quantity, many other colleges would be encouraged to look at the Sinclair machine. That is very much the view of Brian Riches, senior lecturer in the school of electronics and electrical engineering at Leicester Polytechnic. Interested in the fit reports of the Strathclyde Project, he initiated a project at Leicester which he describes as "puny when compared to Strathclyde," but which is nevertheless a clear indication of the move towards a radical rethinking of teaching and learning methods in tertiary colleges.

Originally, Riches proposed a scheme whereby local banks would offer loans to prospective electronics students at Leicester, so that each entrant could arrive equipped with a QL. He still hopes that something of the kind can one day be achieved but, as a pilot scheme, he has approximately 30 QLs with monitors on the polytechnic campus.

They are available to students on his courses, both for use in class groups as individual workstations for fairly closely defined exercises. Programming in Pascal, word processing and demonstrations of electronic circuit design are all part of the pilot scheme, although Riches envisages that, ultimately, computers "could easily have a dramatic effect on the way many subjects are taught. Many subjects are based on mathematics and if some of the techniques were to be based on computers, it could lead to different methods of approaching the material."

> "At last, we have software and operating procedures which we can sell across tertiary education round the world".

His approach is strictly utilitarian. The micro can affect teaching methods profoundly and make available knowledge which is not easily explained by more traditional methods. "You cannot really base your teaching on those techniques until the necessary hardware is in place" he says. That means the polytechnic resources being dedicated to expensive equipment, while the QL takes its place as the individual micro used by each student off campus. He believes that problem-solving and self-learning packages can and should be pursued by students in their own time, in their homes, with the polytechnic facilities as back-up.

A similaar philosophy is behind the scheme inaugurated at Teeside Polytechnic, where computer science students work on language programming and investigate the design and construction of computers, courtesy of individual, home-based QLs. Work continues on campus with polytechnic QLs in the computer science laboratory. Dr. Alan Clements, senior lecturer in computer science, was attracted by the 68000 processor, which already forms the basis of much of the teaching and research under way in the States but he says that the QL "could scarcely be better-suited for the job" of teaching students assembly language programming and computer architecture. He hopes to base part of the Higher National Diploma in information technology on the QL.

Computer aided degree

Edinburgh University is using the micro in a rather more esoteric way. The Gateway Project is concerned with teaching undergraduates integrated circuit design, employing the powerful QL graphics capability in a computer-aided design exercise which has previously been practical only on highly-expensive mainframe equipment. The students work on individual QLs, using them as data-entry workstations with graphical input, and achieve better results than with text-only input mainframe computers.

At the end of their degree course, fledgling electronics engineers have participated in a complete cycle of chip design, from the drawingboard stage to the construction and testing of the finished circuit, and while the result is not up to industrial specifications, because it is a teaching and not a manufacturing exercise, the individual graduate leaves Edinburgh with a thorough understanding of the theory of chip design, courtesy of the QL.

Clearly, the field of higher education is one which is well worth cultivating and, as Kingslake says, "Sinclair, which is typical of him, got there first and filled a hole." It is a hole which will need to be guarded well. In no sense are the colleges sales offices for the QL and ultimately they will serve the interests of their students before those of a micro manufacturer – but Sinclair has sown some healthy seeds.

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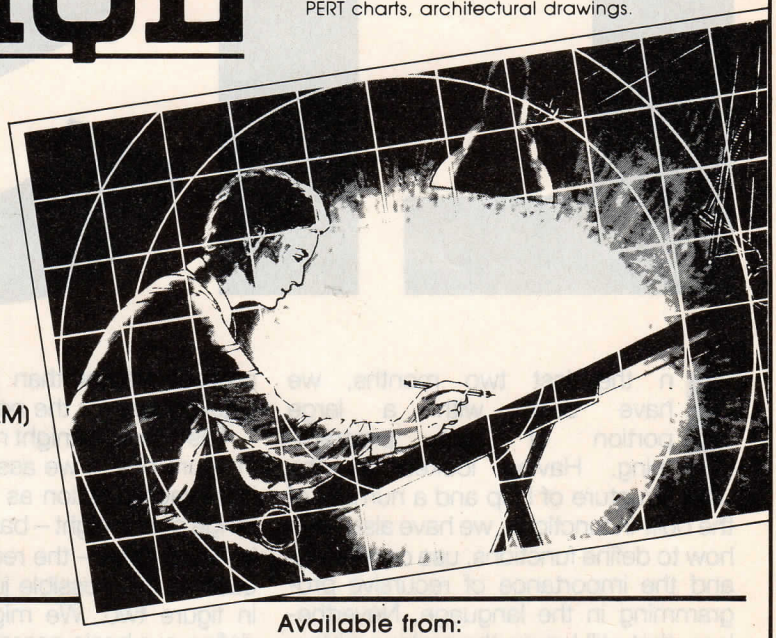

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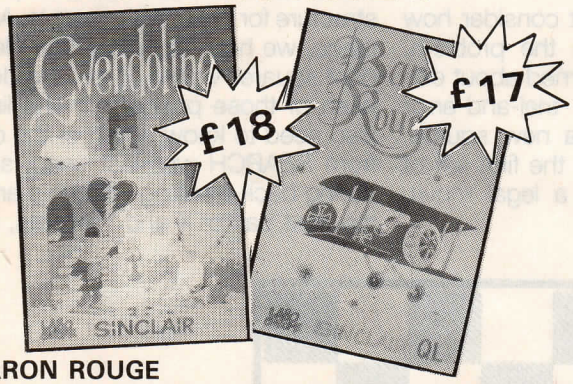

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LISP

In the last two months, we have dealt with a large portion of Lisp programming. Having looked at the structure of Lisp and a number of the built-in functions, we have also seen how to define functions, use conditions, and the importance of recursive programming in the language. Nevertheless, that still leaves the major problem of how to write Lisp programs.

In this article, we will be developing a relatively small but fairly complex problem, showing how to apply the language to solve it.

Lisp is an ideal language for the top-down programming technique. When using it, the main procedure to solve the problem is written, regardless of whether the routine which it calls are yet ready. Subsequently, the next level of routines is written, probably using other unwritten code, and so on, until finally the bottom level of code is included. Ideally, by this time, the programming complexity of the lowest level code is trivial.

Now we look at a classic problem, known as the Knight's Tour. This is where a knight, as in chess, is placed on to a chess board and has to try to cover every square, exactly once, making only legal knight jumps. Starting from any square, there is a phenomenal number of possible sequences and the program we develop finally will take ages to search them all.

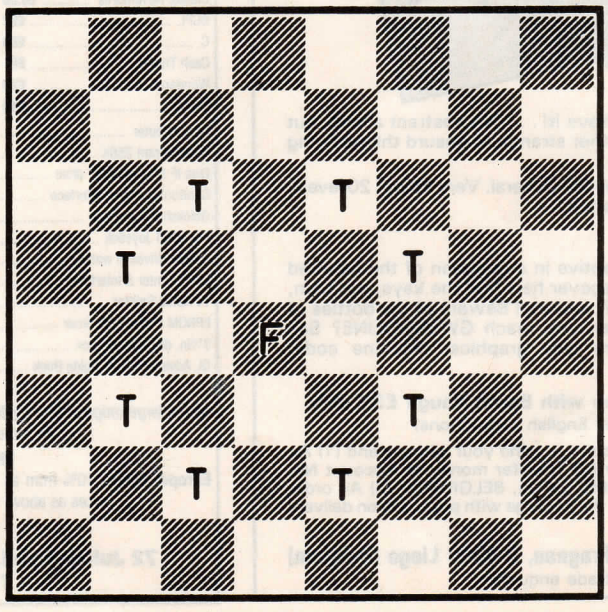
Rather than concerning ourselves with efficiency, we shall find a working program which would find the solution, given sufficient time. We can still easily test our program by having the knight tour boards of fewer than 8 x 8 squares. More efficient programs often use a similar approach to the back-tracking technique which we will develop but also include specialised search procedures to direct the search to likely squares, rather than just picking any legal square for the next jump.

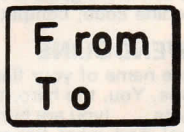
Ths possible knight moves are shown in figure one. If we assume that we will hold each position as two digits in the range one to eight – based on the board in figure three – the required offsets for each of the possible jumps are shown in figure two. We might as well now define our basic search data structure. It will be a list of eight elements, each of which will be a two-element list. Each of those elements will, in turn, be an X-axis, then Y-axis offset for a jump. Our structure called, say, SEARCH, will consequently look something like:

((-2 1) (-1 2) (1 2) (2 1) (2 -1) (1 -2) (-1 -2) (-2 -1))

At this point we must consider how our program will solve the problem. Since we are not concerned about efficiency, the exhaustive trial-and-error approach will give us a new square, from which we will pick the first set of offsets which produce a legal move. That, in turn, gives a further square, where we carry-out the same procedure, and so on until one of two events occurs. Either we find that we have covered all 64 squares, finding a solution or have tried all possible moves from the SEARCH list and none of them gives a legal square which we have not already visited. In that case, we remove the last square visited from our list and back-track to the penultimate square. There rather than take the previous offset from the SEARCH list, we use the next one in sequence. This technique, though rather slow, eventually will guarantee covering all possible routes from any given starting square.

We can now decide on a simple data structure for the entire program. At each stage, we have to hold a complete list of all squares visited so far, in order. For each of those positions in the list, we also need to know which of the offsets from SEARCH was last used, so that during back-tracking we can start from the next pair of X and Y offsets, other-





THE LANGUAGE

wise we will find ourselves in a infinite loop.

The simplest approach is often best, so for each position in the main data structure let us follow the X and Y co-ordinates of the square with a copy of the list SEARCH. Then, whenever we use one of the offsets, we will remove it from the copy of the list. Our final data structure will thus be of the form:

```
((Xn Yn (search-list))
  "   "    "    "
  "   "    "    "
  "   "    "    "
  (X2 Y2 (search-list))
  (X1 Y1 (search-list)) )
```

where (X1,Y1) is the starting square. Choosing square (1,1) for the start position, we know that our structure should begin as:

((1 1 ((-2 1) (-1 2) (1 2 (2 1) (2 -1) (1 -2) (-1 -2) (-2 -1)))

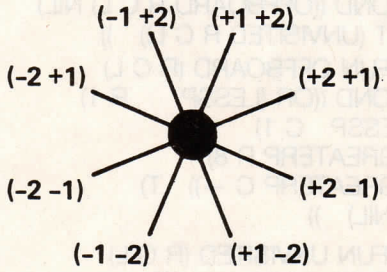
Each time we check an offset, the new square must be opn the board – i.e., both X and Y must be in the range one to eight – and it must be a previously-unvisited square. So, looking for the first jump, the first two offsets ((-2 1) and (-1 2)) both give illegal positions and will be removed from this copy of the list. The third offset ((1 2)) gives a legal position – in this case (2 3) – so that will create a new structure in the list, which should now look like:

((2 3 ((-2 1) (-1 2) (1 2) (2 1) (2 -1) (1 -2) (-1 -2) (-2 -1))) (1 1 ((1 2) (2 1) (2 -1) (1 -2) (-1 -2) (-2 -1))))

If you have followed everything so far, you are in a position to write the top-level of the routine. It is very simple:

```
(DEFUN KTOUR ()
  (SETQ SEARCH ((-2 1) (-1 2) (1 2) (2 1)
  (SETQ SOLUTION (LIST (LIST 1 1
  SEARCH)))
(LOOP
  (UNTIL (ZEROP SQUARES)
  NO-SOLUTION)
  (SETQ SOLUTION (JUMP SOLUTION)
  (UNTIL (EQ SQUARES 64)
  (OUTPUT SOLUTION)) ))
```

Working through this, SETQ SEARCH sets up the offset list, as described previously. SETQ SQUARES sets a variable which will count the number of squares visited – i.e., presently held in our list structure – so that we know when we finished. SETQ SOLUTION sets up the starting structure, as position (1 1) and the list SEARCH. We then enter the main program loop, in which one of two conditions will occur:



(a) The variable SQUARES reaches zero, indicating that no solution exists. That should never happen but provides an exit in case our program tries all possible combinations of moves from a given start square and back-tracks to an empty list.

(b) After updating our SOLUTION, by calling function JUMP, we find that we have visited all 64 squares, in which case we should OUTPUT the SOLUTION.

You will notice at this point that we have been able to write the main program, even though two of the functions used – JUMP and OUTPUT – have not been written. We can start amending this now. The OUTPUT function must traverse the list, printing the co-ordinates Xn and Yn – in this case, 'n' will be 64 – then moving on to the next co-ordinates, X(n-1) and Y(n-1), until the entire list has been printed.

Quick examination will show that by removing the first element of the list, a very similar list – just one element smaller, but with exactly the same structure – will result. Therefore, our OUTPUT routine can be a simple recursive call. That will mean that we print the co-ordinates, ending with the start square. It could easily be changed but does not really matter. OUTPUT will finally look something like:

```
(DEFUN OUTPUT (L)
  (COND ((NULL L) (PRINTC))
    (T (PRINC LPAR (CAAR L) (CADAR
L)
    RPAR BLANK)
      (OUTPUT (CDR L)))    ))
```

There are one or two features in this with which we have not yet dealt. LPAR, RPAR and BLANK are the left parenthesis, right parenthesis, and space, for output purposes. PRINTC, on its own, merely outputs a carriage return at the end of the printout and PRINC is used to output the co-ordinates (bracketed), without a carriage return. As you can see, having printed the first co-ordinates in the list, the (OUTPUT (CDR L)) command will do the same thing for every element of the list except the first. That is why a check has to be made for the NULL condition, which will signify the end of the printout.

Now to our other undefined procedure, JUMP. It has to look at the first – i.e., the last generated – position in our main structure and decide what to do. Two possibilities are:

(a) There are no more offsets remaining in the copy of SEARCH. Hence we must get rid of this latest position and back-track to the previous square. We will use a function called ENDSEARCH to check for an ampty SEARCH list and BACKTRACK to perform the back-tracking operation.

(b) Otherwise we must use the next offset to try to make a legal move. That

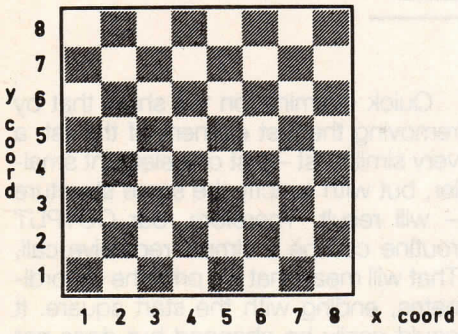
will be done by the function TRYJUMP.

We will not bother about these three new functions yet but we can still write the JUMP function, which will be:

```
(DEFUN JUMP (L)
  (COND ((ENDSEARCH L)
  (BACKTRACK L))
   ( T   (TRYJUMP L))   ))
```

We can then start writing the functions for the next level. ENDSEARCH has to check for the SEARCH list – nearest the front of the main list structure – being NULL, i.e., an empty list, returning True if this is the case and False otherwise. Consequently, ENDSERCH will look like:

```
(DEFUN ENDSEARCH (L)
  (NULL (CAR (CDDAR L))) )
```



If ENDSEARCH returns the answer true, we must back-up to the previous square. If you look back to the main KTOUR routine, you will see that it is merely a matter of JUMP returning the truncated structure, which will then be assigned to SOLUTION. We must not forget to update the variable SQUARES. BACKTRACK consequently will look like:

```
DEFUN BACKTRACK (L)
  (SETQ SQUARES (SUB1 SQUARES))
(CDR L)                        )
```

The new function SUB1 is built into the Metacomco Lisp implementation, being equivalent to (PLUS 1 SQUARES).

So far, so good. The only function still outstanding is TRYJUMP, which should try to add a legal move to the list structure. There are two possibilities:

(a) Using the next set of offsets from the latest position in the list gives an illegal square, either because it is off the board, or because we have already visited it. In this case, we must remove the offending offsets from the copy of SEARCH at the head of the list and return this new list to the main program. That will be performed by a function called TRYNEXT, which we will define soon.

(b) The offset gives a legal position, so a new set of co-ordinates must be added to the head of our main list structure, together with a complete copy of SEARCH, and the variable SQUARES should be updated. That can be done by a function called ADDSQ. We are then in a position to write TRYJUMP:

```
(DEFUN TRYJUMP (L)
  SETQ ROW (PLUS (CAAR L)
  (CAAR (CDDAR L))))
  SETQ COL (PLUS (CDAR L)
  (CAR (CDAAR (CDDAR L)))))
  (COND ( (LEGAL ROW COL L)
  (ADDSQ ROW COL L))
(T              (TRYNEXT L))          ))
```

As you can see, that sets the variable ROW and COL to the possible new square, checks to see whether the new square is LEGAL, and calls the appropriate procedure – ADDSQ or TRYNEXT. These two functions will be along the lines:

```
(DEFUN ADDSQ (R C L)
  (SETQ SQUARES (ADD1 SQUARES))
  (CONS (LIST R C SEARCH)
        (CDR L))
```

We are now almost finished. The final function is LEGAL, which must check whether ROW and COL – using R and C – are either off the board or previously visited. Function OFFBOARD will return True if either R or C is outside the range one to eight. Function UNVISITED will return True if the position (R C) is not held anywhere else in the main list structure. UNVISITED works by checking whether R and C are equivalent to the first co-ordinates in the list structure, then calling itself recursively to check everything but the first co-ordinates in the structure. These final functions are:

```
(DEFUN LEGAL (R C L)
  (COND ((OFFBOARD R C L) NIL)
   ( T (UNVISITED R C L))   ))
(DEFUN OFFBOARD (R C L)
  (COND ((OR (LESSP      R 1)
  (LESSP   C 1)
    (GREATERP R 8)
    (GREATERP C —))   T)
( T NIL)   ))
(DEFUN UNVISITED (R C L)
  (COND ((NULL L )    T)
    ((AND (EQ R (CAAR L))
      (EQ C (CADAR L))) NIL)
    (T (UNVISITED RC (CDR L)))   ))
```

Everything is now complete and the entire program is written. It is shown in a more concise form in figure four. To be of any practical use, the program needs a built-in heuristic which will direct the search to likely squares, otherwise there are a theoretical 8^{63} possible solutions. Obviously there is likely to be more than one solution from any given starting square and many of the options will be discounted immediately by the OFFBOARD check, but that still leaves a formidable number of combinations and you cannot really expect Lisp to solve it this side of Christmas.

In the final article next month, we will deal with one or two more features of the language and look at the Metacomco implementation of the language, showing what you get for your money.

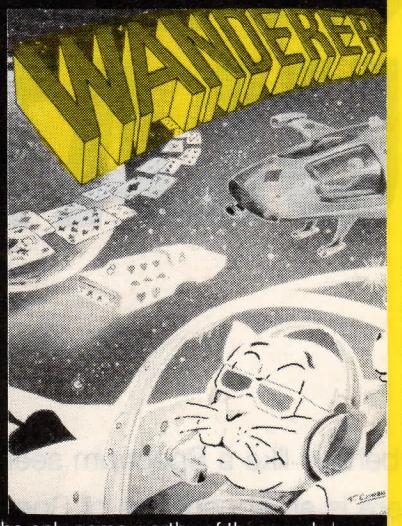
Figure 4.

```
(DEFUN KTOUR ()
  (SETQ SEARCH '((-2 1) (-1 2) ( 1 2) ( 2 1)
                 ( 2 -1) ( 1 -2) (-1 -2) (-2 -1)))
  (SETQ SQUARES 1)
  (SETQ SOLUTION (LIST (LIST
  1 1 SEARCH)))
  (LOOP
    (UNTIL (ZEROP SQUARES)
    'NO-SOLUTION)
    (SETQ SOLUTION
    (JUMP SOLUTION))
    (UNTIL (EQ SQUARES 64)
    (OUTPUT SOLUTION))   ))
(DEFUN OUTPUT (L)
  (COND ((NULL L) (PRINTC))
   ( T (PRINC LPAR (CAAR L)
   CADAR L) RPAR BLANK)
      (OUTPUT (CDR L)))    ))

(DEFUN JUMP (L)
  (COND ((ENDSEARCH L)
  (BACKTRACK L))
  (TRYJUMP L))   ))

(DEFUN ENDSEARCH (L)
  (NULL (CAR (CDDAR L)))   )

DEFUN TRYJUMP (L)
  (SETQ ROW (PLUS (CAAR L)
  (CAAAR (CDDAR L))))
  (SETQ COL (PLUS (CDAR L)
  (CAR (CDAAR (CDDAR L)))))
  (COND ((LEGAL ROW COL L)
  (ADDSQ ROW COL L))
   (T          (TRYNEXT L))                ))

(DEFUN LEGAL (R C L)
  (COND ((OFFBOARD R C L) NIL)
  ( T (UNVISITED R C L))   ))

(DEFUN OFFBOARD (R C L)
  (COND ((OR (LESSP R 1) (LESSP C 1)
    (GREATERP R 8) (GREATERP C 8)) T)
  ( T NIL)      ))

(DEFUN UNVISITED (R C L)
  (COND ((NULL L) T)
    ((AND (EQ R (CAAR L))
      (EQ C (CADAR L))) NIL)
    ( T (UNVISITED R C (CDR L)))   ))

(DEFUN TRYNEXT (L)
  (CONS (LIST (CAAR L)
    (CADAR L)
    (CDAR (CDDAR L)))
  (CDR L))

(DEFUN ADDSQ (R C L)
  (SETQ SQUARES (ADD1 SQUARES))
  (CONS (LIST R C SEARCH)
    (TRYNEXT L))          )

(DEFUN BACKTRACK (L)
  (SETQ SQUARES (SUB1 SQUARES))
  (CDR L)                        )
```

SINCLAIR USER CLASSIC

★★★★★

The Wanderer



CULT GAMES are unheard of on the QL, but I've got a feeling that state of affairs is likely to change when The Wanderer hits the screen.

I've seen 3D glasses – but only The initial demo displays with their strange conglomeration of objects floating through space tell of the miracles to come. Bicycles spin past, pentagons twist and turn, and cards float lazily towards infinity.

Press Enter and the space map squares are blank and represent sectors. The other squares represent worlds on which you can play poker for energy and shield power, and gateways into other galaxies.

The plot revolves around some nasty looking moggies – who are on the warpath, destroying everything they find in their path through space. The 3D perspective makes it difficult to destroy them. If you clip only the side of one of their space crafts you might get hit by floating debris, followed by a venomous attack from their laser guns.

If you were hoping for a version of Elite on the QL, The Wanderer falls far short. Although there are many types of feline battle cruiser, including one which looks like a flexi-lamp complete with domed shade and stand, the planets on the star map do not have their own economies – the ideal is not to trade.

You must gamble at the poker tables – like Han Solo in *Star Wars* – and blow everything out of space.

Despite the lack of sophistication in plot, **The Wanderer** is the only game worthy of the arcade tag on the QL. The 3D graphics are spectacular and at times you will feel as if you are about to fall into the screen.

The transition between star systems initiated from the star map ridicules those industry pundits who say that if you want fast graphics on the QL you are flogging a dead horse. When you enter space warp your craft rushes through space. The stars swirl in a vortex and you will feel very, very sick.

Pyramide, a French company, has done wonders with its first product for the British market. Its superb packaging and documentation complement a program which shows its author to be very talented.

John Gilbert,
Sinclair User, April 1986
Page 89.

"undoubtedly one of the best games yet released for the QL,"
ZX Computing Monthly · May 1986

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SPECTRUM SIMULATION

Getting your QL to behave like a Spectrum seems like an odd idea, but there is an abundance of Spectrum software which, with a little coercion, the QL can be persuaded to run. Marcus Jeffery overcomes the major problem – the screen.

It may seem ridiculous to want to turn your powerful QL micro into a humble Spectrum but it must be admitted that the Spectrum has a vast market of software available for it, some of very high quality. Converting commercial programs is obviously a task of its own and well beyond the scope of any article. Nevertheless, there is a multitude of program books and magazine listings for the Spectrum which are just waiting to be converted.

In *QL User,* December, 1985, Basic Differences delved into the coding problems you were likely to meet when converting Spectrum Basic into SuperBasic, including the mathematical functions, strings and string functions, logical operators, control structures, data and file handling, I/O and graphics It was mentioned that the major stumbling-block would almost certainly be the screen display.

Squeezing the screen

It is a sad point but the fact is that the QL 32K screen memory finds it very difficult to simulate the Spectrum 6K screen and 768-byte Attribute file. The QL screen is far more versatile but however you try to arrange matters, the Spectrum screen refuses to fit properly.

FIG 1.

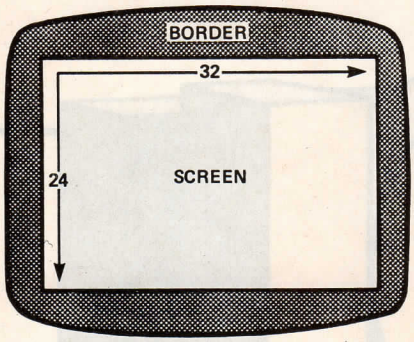


FIG 2.

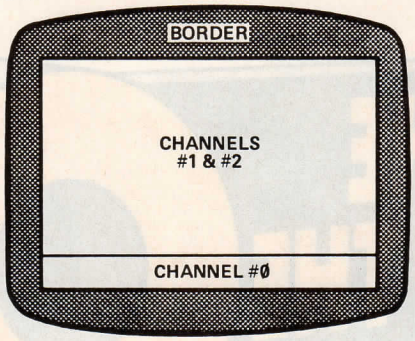


Figure one shows the character layout of the Spectrum display, which is divided into 24 lines of 32 characters each. In a similar way to the QL TV mode, the output and graphics channel (channel #1) and the program listing channel (channel #2) are both overlaid in the top 22 lines of the display and the command and error channel (channel #0) uses the bottom two lines, giving a display in the form shown in figure two.

Although printing to (channel #0) will display in the bottom two lines, the other two channels are not distinguished and are merely the output area. In addition you will also note that the Spectrum has a surrounding border area. That, as with the rest of the display, can be set to any of eight colours. In fact, a command called BRIGHT will allow you to set the intensity of any colour on the display, giving a theoretical 16 colours, though half of them are merely dirty-looking resemblances of the others.

Moving to our QL screen simulation, one decision has already been made for us – we need eight-colour mode. Choosing 'MODE 8' will give 256 double-width pixels along the horizontal axis and 256 normal-width pixels on the vertical axis. Unlike the QL, Spectrum characters, as with most other micros,

FIG 4.

SPECTRUM	QL	COMMAND USE
AT line,col	AT line,col	Set print position
CLS	CLS [ch]	Clear screen (should be CLS#1 and CLS#2)
COPY	-----	See SCOPY (figure five)
FLASH 0 or 1	FLASH [ch] 0 or 1	Turn flashing text of/on (Channel#1 will usually be sufficient)
INK colour	INK [ch] colour	Set print colour. (Should be ch#1 and ch#2).
INVERSE 0 or 1 colours	-----	Print in inverse (see text)
PAPER colour	PAPER [ch] colour	Change background print colour
TAB column	TO column	Set start column for printing.

are held in an 8 x 8 array of pixels. If we try to simulate this, we find that we need (32 characters) x (8 pixels) across the display. That gives 256 pixels. How convenient. No, I'm afraid it is not. That produces a number of problems. We could easily live with the no border area but we could not ignore the display disappearing over the edges of most TV screens. You see, in TV mode, your QL uses only the central portion of the display. You can easily check this on a TV by powering-up the QL in Monitor Mode and just start typing. You will have typed a number of characters before they start appearing in the bottom left of the screen. In addition, the Spectrum pixels are square – unlike our double-width mode 8 pixels – so to get a reasonable display we would have to use twice as many vertical pixels as the Spectrum. Unfortunately, 2 x (24 lines) x (8 pixels) gives 384 pixels, which is rather more than the 256 available.

The alternative option is to use four-colour mode. That would easily allow us to fit the Spectrum screen on to the QL display, including plenty of room for the border area. We would also be able to re-write the QL print routines to simulate the Spectrum, implement Spectrum-like User-Defined Graphics, re-write The colour commands to work on character areas, and so on. We would still have

FIG 3.

```
1000 DEFine PROCedure Spectrum
1010 LOCal k$
1020     MODE 8
1030     WINDOW#0,384,20,64,228
1040     PAPER#0,7:INK#0,0:CLS#0
1050     WINDOW#1,384,220,64,8
1060     PAPER#1,7:INK#1,0:CLS#1
1070     WINDOW#2,384,220,64,8
1080     PAPER#2,7:INK#2,0:CLS#2
1090     OPEN#4,SER1
1100     OPEN#5,scr_512x256a0x0
1110     SBORDER 7
1120     PRINT#0, 1982 Sinclair
         Research Ltd"
1130     k$=""
1140     REPeat wait
1150        k$=INKEY$
1160        IF k$<>"" THEN EXIT wait
1170     END REPeat wait
1180     CLS#0
1190 END DEFine Spectrum
1200 :
1210 DEFine PROCedure SBORDER (col)
1220     BLOCK#5,504,8,4,0,col
1230     BLOCK#5,504,8,4,248,col
1240     BLOCK#5,60,256,4,0,col
1250     BLOCK#5,60,256,448,0,col
1260 END DEFine SBORDER
```

the problem of limited colours but by choosing the games we want to convert carefully, we can minimise this inconvenience.

Eight colour compromise

The only remaining option is to retain the QL character fount – why Sinclair could not use 'font' like everyone else, I will never know – based on six double-width pixels by 10 vertical pixels, and implement the 24 line by 32 column display. That means we cannot simulate User-Defined Graphics and the scale of graphics commands will be incorrect, but it gives us an eight-colour, Spectrum-like display.

Using this method, we can also show a border, as on the Spectrum, but the standard QL BORDER command will not work. That is because this command works on separate wiondows and with the Spectrum window layout – figure two – this would either mean the window becoming effectively smaller and the input channel being separated from the other two, or that the two borders would overlap. Instead, figure three which sets up the Spectrum screen, includes an SBORDER – Spectrum BORDER – command which will draw a border round all the windows, as a combination of four blocks. If you type-in the listing from figure three, then add the line **10 Spectrum** you should obtain a Spectrum-like initialisation screen. Line 1120 adds the finishing touch with the Sinclair copyright message. It might even convince someone that you had a Spectrum inside your QL, though your reasons for wanting to do that would be dubious. Pressing any key at that point will give you a flashing cursor in the lower display area.

QL in – Spectrum out

Sending output to the printer is done on the Spectrum by means of the LPRINT and LLIST commands, for printing and program listing respectively. On the QL, the initialisation sets up channel four as the SER1 output device, so hardcopy output is achieved by PRINT #4 and LIST#4. A further feature, available on the Spectrum – figure four – is the COPY command. It will dump the entire screen contents, including the two lower input lines, to the printer. It is a very useful feature which the QL lacks.

FIG 5.

```
2000 DEFine PROCedure SCOPY
2010 LOCal i,j,k,l,b%(4)
2020     b%(1) = 192
2030     b%(2) = 48
2040     b%(3) = 12
2050     b%(4) =  3
2060     PRINT#4,CHR$(27);CHR$(65);CHR$(1)
2070     FOR i=0 TO 239
2080        PRINT#4,CHR$(27);CHR$(75);CHR$(128);CHR$(1);
2090        FOR j=0 TO 47
2100           k=132112+128*i+2*j
2110           FOR l=1 TO 4
2120              IF (PEEK(k)&&b%(l))+(PEEK(k+1)&&b%(l))=0 THEN
2130                 PRINT#4,CHR$(0);CHR$(0);
2140              ELSE
2150                 PRINT#4,CHR$(128);CHR$(128);
2160              END IF
2170           END FOR l
2180        END FOR j
2190        PRINT#4
2200     END FOR i
2210 END DEFine SCOPY
```

The code in figure five gives a Super-Basic version of this command. It was written originally for use on a Taxan Kaga printer but should work equally well on any Epson-compatible printer. If you wold like to modify the program

FIG 6.

```
2000 Define the procedure.
2010 Set Local variables.
2020 The b% array is used to store the appropriate colour bits.
2030      for the four pixels which are found in each word in
2040      the screen display.  So,  b%(1)  ANDED  the
   first  and second
2050      byte will show whether the pixel is set.
2060 Set single dot paper feed.
2070 Loop through 239 lines(24 character lines,each 10 pixels)
2080 Print single-density graphic codes for 384 pixels.
2090 Loop through 48 horizontal screen words.
2100 Calculate word-location. 132112 is the start of our
Spectrum screen.
2110 Each word contains four double-width pixels.
2120 Check pixel. IF zero, THEN
2130                        Print two horizontal spaces.
2140                     ELSE
2150                        Print two horizontal dots.
2160               ENDIF.
2170 End of four-pixel loop.
2180 End of horizontal print row.
2190 Move to next dot row of printer.
2200 End of printing
2210 End procedure definition.
```

for use on other printer types, figure six gives details of the variables and how the program works. Written in SuperBasic, this screen dump program is obviously very slow and will take some time to dump the entire screen. A better option would be to acquire one of the many commercially-available screen dump programs.

Figure four shows the other Spectrum I/O commands and their QL equivalents. In many cases, the Spectrum commands will be found embedded inside PRINT statements, such as:

PRINT AT 4,4; "SINCLAIR QL WORLD"

When converting this to the QL, the AT statement should be placed before the PRINT, as in:

AT 4,4: PRINT "SINCLAIR QL WORLD"

With many of the other commands, you will notice that the QL format gives the option of specifying a channel. Since we have overlapped channels one and two, many of those commands should apply to both simultaneously. For instance, if you ran the following Spectrum program:

```
10 PAPER 3
20 PRINT "Hello"
30 LIST
```

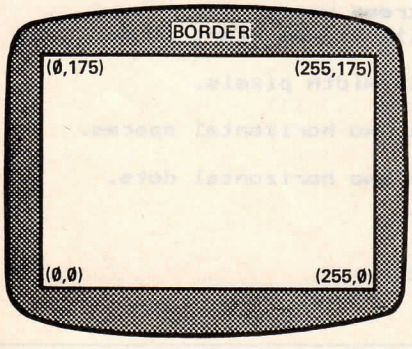
both the output (Hello) and the program listing could be shown on a magenta background. On the QL, however, the PAPER command would apply only to the output channel. Normally, that would not matter, because when running a program, you are unlikely to require mixed output and listings. If it proves to be troublesome, the best method is to write a series of simple procedures to simulate the Spectrum output commands. An example is shown for the PAPER command in figure seven.

FIG 7.

```
DEFine PROCedure SPAPER
  (col)
   PAPER#1,col
   PAPER#2,col
END DEFine SPAPER
```

Another command which is not implemented on the QL is INVERSE. The command 'INVERSE 0' inverts the colours of all texty printed, until the 'INVERSE 0' command is given. The easiest way to implement this on the QL is to hold the current ink and paper colours as global variables, changing them for INVERSE printing, then restoring them when the 'INVERSE 0' command is reached.

FIG 8.



Problematic pixels

Spectrum graphics are based on the pixel co-ordinates of the Spectrum display. This is 256 x 176, giving the display shown in figure eight; the bottom two lines are ignored in this system. Unfortunately, we have not been able to use the ideal pixel-to-pixel conversion, so our QL display is 384 x 220 pixels, with each of the horizontal pixels being double-width. Further, the QL SCALE command is not versatile enough to enable us to define the correct multipliers for both axes. This command allows you to set only one axis and adjusts the other accordingly

There is no foolproof method of avoiding this pixel problem. The best compromise is to adjust the X and Y co-ordinates to fit as well as possible on to the QL screen, writing a series of procedures to simulate the Spectrum graphic commands. A few of them are shown in figure nine.

FIG 9.

```
3000 DEFine PROCedure SPLOT (x,y)
3010   POINT INT(1.5*x+.5),INT(1.25*y+.5)
3020 END DEFine SPLOT
3030 :
3040 DEFine PROCedure SDRAW (dx,dy)
3050 LINE_R TO INT(1.5*x+.5),INT(1.25*y+.5)
3060 END DEFine SDRAW
```

One Spectrum command is impossible to simulate with our present system. This is:

'ATTR line, col'

which returns the Attribute of the character square at the co-ordinates given. The attribute is a number in the range 0 to 255, where the lowest three bits give the ink colour, the next three bits give the paper colour, the next bit gives the brightness –on/off – and the next bit gives the flashing state – on/off. The Spectrum is able to do this because it holds a separate attribute file containing the relevant information.

We could try to find what we want by PEEKing the appropriate bits in our QL screen character square but that still would not be sufficient. Not only would we have no idea which was the paper colour and which was the ink colour – it all depends which character we printed – but, given our present system, we could find more than two colours within the character area; that is impossible on the Spectrum, other than by using extremely complex interrupt techniques.

Another approach to the Attribute screen problem is to hold a separate attribute screen of your own. That should be done in memory, using RESPR, since it will contain only numbers in the range 0 to 225, but an easier method from SuperBasic would be to use an array: a%(21,31)

Initially, set all these values to seven but whenever a character is printed, update the relevant line – 0 to 21 – and column –0 to 31 – value in the a% array. This value should be of the form:

1 * Paper colour (0 to 7)
+ 8 * Ink colour (0 to 7)
+ 128 * Flashing (0 or 1)

(The BRIGHTness function is not implemented)

To simulate the Spectrum ATTR command all you need do is read the relevant array element. To do that successfully, you will need to write your own PRINT procedure. It would work in much the same way as the normal PRINT command, calling PRINT repeatedly to perform the output. In addition, the procedure would always have access to the current line and column – as global variables – and would update them as each character is printed, setting the appropriate a% array element and updating the line and column positions – column would obviously go from 31 to zero, if printing continued over more than one line. Bear in mind also that scrolling the screen would mean scrolling all the values in the attribute array, with code similar to:

```
100 FOR i = 0 TO 20
110 FOR j = 0 TO 31
120 a% (i,j) ÷ a% (i+1,j)
130 END FOR j
140 END FOR i
```

An alternative approach

It can be disconcerting to see how difficult it is to produce some effects on the QL which are relatively easy on the lesser micro. That is not so much because of the relative powers of the two machines but the different methods they use.

The majority of Spectrum programs could be written in only four colours and many of the programs you will encounter have only that number. If that is the case, we obviously can use the QL in four-colour mode. Consequently, we are able to perform a one-to-one mapping of the Spectrum 8 x 8 character grids on to the QL screen, re-define the character fount, including a special print routine for the new size cells. That would also allow the implementation of the Spectrum User-Defined Graphics, POINT and ATTR commands, and so on. We will be looking at this possibility next month.

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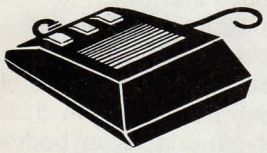
QL MOUSE



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QL WORLD JUNE

SOFTWARE FILE

Jason Ball looks at the latest games for the QL

Baron Rouge

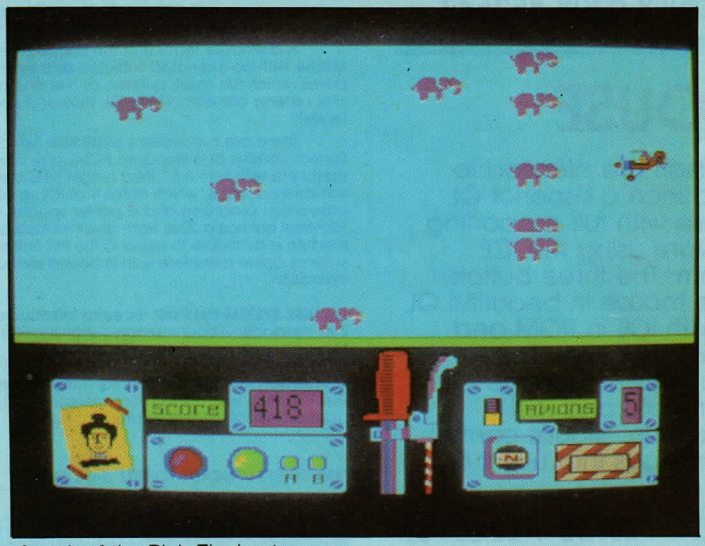
Baron Rouge is the first of two new releases from Belgian software house Labochrome, which, to the best of my knowledge has not produced anything else for the QL.

As a début product I am pleased to say that it is very impressive. While the program boots up you are presented with a simple but effective cartoon-style introductory screen which really sets the style for what follows.

The game is probably best described as a lateral version of *Space Invaders*. You control the Red Baron in his biplane, moving him up and down the left-hand side of the screen. Assorted aliens make their entrance stage left and move towards you in a threatening manner. Your job, predictably enough, is to shoot them down before they crash into you and deprive you of one of your five lives.

A fairly boring and predictable format, you might think, but what really makes the game is the quality of the graphics and the imagination which has gone into producing them. Hang-glider pilots, fish on skateboards, winged horses, parakeets, electric eels, and other nasties – 20 in all – are depicted in superb cartoon graphics.

The only criticism to be made is that the gameplay is a little on the simple side. Apart from that one fault the game has much to recommend it.

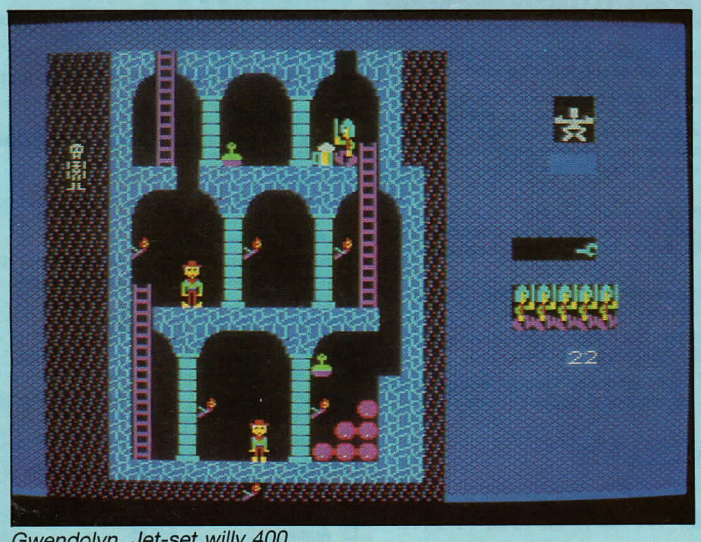


Attack of the Pink Elephants.

Gwendoline

This is the second Labochrome offering for the QL in every sense of the word. 'Inserez la cartouche mére dans le mdv2 et appayez sur la bar d'espacement' we are informed. By the time you read this, fully translated versions should be available so you will probably not find it necessary, as I did, to dig into the French dictionary.

The storyline in this one is that your fiancée, *Gwendoline*, is being held captive in a dungeon. You must reach her by running along the platforms, up and down ladders and jumping over ghouls and gremlins. To complicate matters a little you have to pick up a light snack every now and then to avoid running out of energy. Certain doors also require keys to unlock them before further progress can be made.



Gwendolyn. Jet-set willy 400.

It used to be said of games like this – much to the disdain of the authors – yet another version of *Jet Set Willy*. In other words a platform type game in which the object is to travel through various rooms collecting certain essential objects from particularly inaccessable locations.

Gwendoline is a perfectly adequate rendition of an old and successful theme and the graphics are well up to standard. So why am I less than impressed? Probably for the simple reason that I did not find it much fun to play. The rooms are cramped and unimaginatively designed, probably as a result of being squeezed into two-thirds of the screen width. Why that has been done is anybody's guess. The information provided in the remaining third – energy and lives remaining – could easily have been fitted in elsewhere. In all a bit of a dissappointment after Baron Rouge.

Baron Rouge £17
Gwendoline £18
Labochrome
78 Rue Saint Gilles
Liege
Belgium

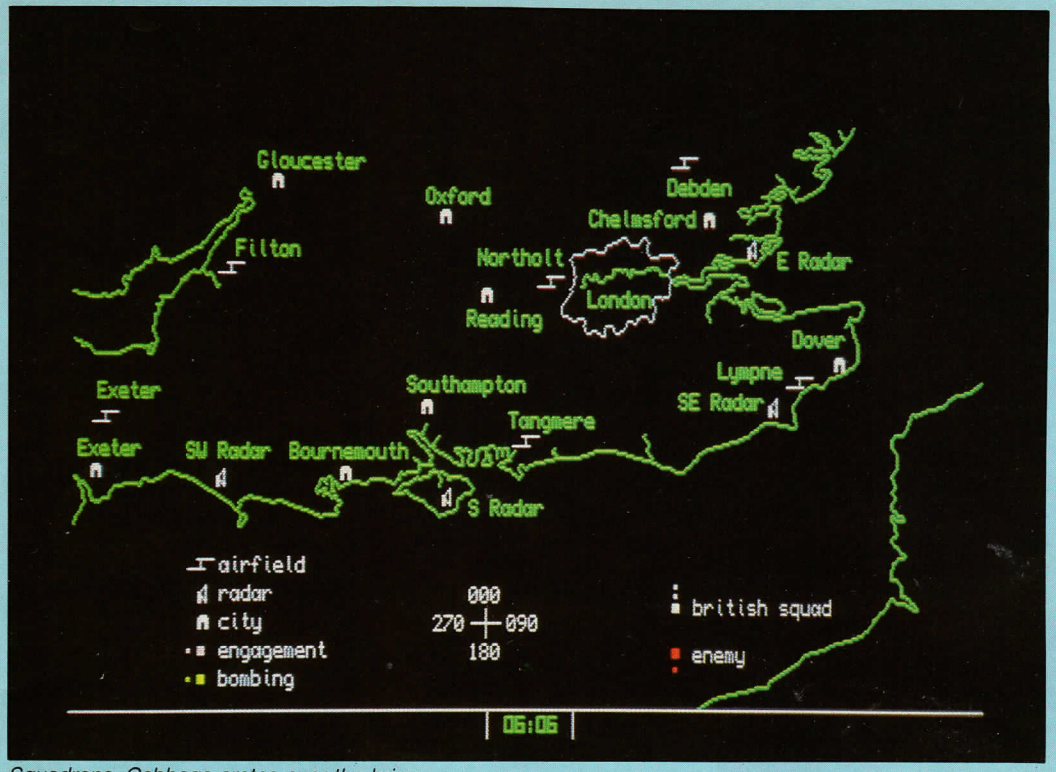
Squadrons

Described by the producers as 'designed to fit into the market between *Chess* and *Space Invaders*'; *Squadrons* is a strategy game which places you in control of Britain's wartime air defences.

The action takes place over the south-east coast and the Channel, represented by a plotting map complete with cities and airfields. Events occur at five times 'normal' speed, hence it does not take long for the first enemy squadrons to appear over the Channel.

Your job is to scramble fighters from British airfields and plot courses to intercept the incoming enemy. Should any of them manage to penetrate your first line of defence you must sound the air raid warnings and alert the anti-aircraft batteries.

In addition to the plotting map, which indicates the positions of both your own



Squadrons. Cabbage crates over the briny.

and enemy forces, status tables can be selected using the function keys. They give details of all your operational squadrons such as height, number of fighters, base airfield, time of take-off and course. The same information is provided on the enemy. A fourth screen provides a complete statistical breakdown of losses on both sides, number of standby aircraft, airfield status and operational radar.

With any game of this kind the secret is to keep your eye on a dozen things at one time and anticipate what will happen, in the vain hope of averting a disaster of catastophic proportions. The game is extremely well written in that it caters for everything down to the most minor detail. I was at a loss to understand why one of my squadrons could not see the airfield when I instructed it to land. It then occurred to me that it would be difficult to see anything, other than cloud, at 23,000ft.

When the battle is concluded, or you decide to quit, your effort is assessed by none other than the Group Captain. Despite leaving half of London and the Home Counties under a pile of rubble, for which I was duly reprimanded, I enjoyed the experience.

Squadrons
Peakcrown Ltd
4 Beeby Road
Scraptoft
Leicestershire
LE7 9SG

Blobz

Rarely have I encountered a game so aptly described by the title. You control a blob by means of the cursor keys or joystick. This particular blob is distinguished from the other blobs on the screen by the fact that it has a chevron on it – the others have crosses.

If you have not already guessed, you must shoot the other blobs because if they bump into your blob you lose a life. The

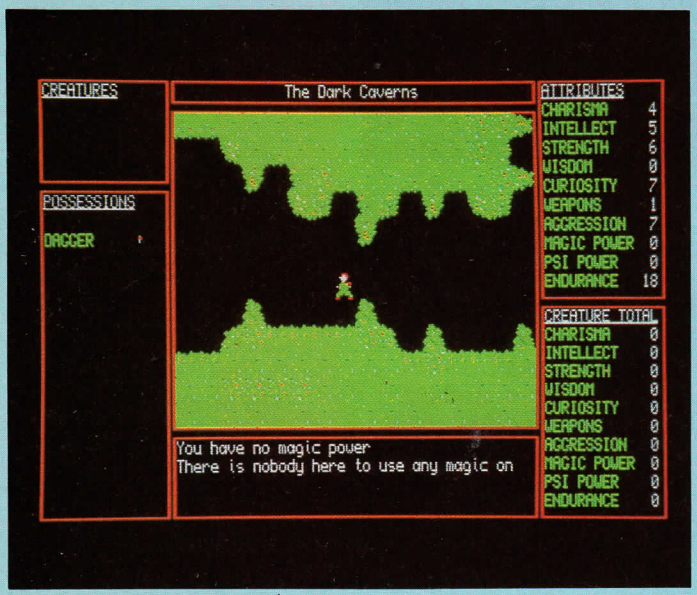
Blobz. Yours is the one with the chevrons.

accompanying literature contains all the usual stuff about firing 'high pressure jets of antibodies' and being 'transported to another part of the galaxy' but with such a basic game it is really not worth bothering. There are some red blocks dotted round the screen which you can use for cover. They were apparently left behind by a previous civilisation. No doubt they left for better things.

Blobz £5
Smiling Software
26 Dale Road
Stockport
SK6 6HA

with creatures are displayed in a sort of command window at the bottom of the screen.

As with any adventure there are clues to be solved and the approach is very much one of try it and see what happens. This invariably ends with your untimely demise but there is only one way to learn. Initially I tried the friendly approach, conversing with each creature I encountered. That produced various responses. The goblin cackles horribly and the dwarf laughs at you. More usefully, the woman tells



In search of The Elixir of Life.

Dragonhold

'Deep in the land of the Hidden Kingdoms, guarded by a vicious and evil dragon, can be found the Elixir of Life. It is your task in this animated arcade adventure to discover it. The action takes place on a four-way scrolling panorama which depicts the labyrinthine landscape as your little man makes his way through it.

As well as the animated display, there are six subsidiary windows which provide information on the current state of play. Among other things they display objects in your possession, a list of your attributes – strength, charisma, intellect – as well as those of any creatures close by. Any text messages and conversations

you "men of violence repulse me", an indication that they key to further progress is to go unarmed.

Attacking the creatures was fairly ineffective. Most of them are better-equipped than you to deal with physical assault and are best left well alone, at least until you have accumulated some weapons and more power. In the early stages I was content with exploring the different locations and collecting all kinds of interesting things.

Once you have discovered the clue to opening the doors you can wander through Trollhold, the Hidden Kingdoms, Castlefort, the Deep Dungeons, and a few other places besides. You can save your progress at any stage, or start a new game, in which case all the clues are shuffled round and left in different places.

Dragonhold is a well-put-together adventure; the arcade element certainly gives it an edge over more conventional games. It should keep you amused, or aggravated, for many a long evening.

Dragonhold
Rubicon
11 Bannerdale Road
Sheffield S7 2DJ

QL Karate

This is a QL version of the martial arts programs with names like *Way Of The Exploding Fish* and *Yie Ar Kung Fu* which have been so incredibly successful on the Spectrum.

The opening screen depicts an oriental-looking background of pagodas, lanterns and icons – real ones. The two opponents, yours, in green and the computer's in white, battle it out in the foreground. The various offensive and defensive manouvres are carried-out simply by moving the joystick in a given direction, for example, pulling straight down makes your man drop to the floor and lash out with his left foot. Diagonally left sends him into a particularly agile backward somersault. In combination with the fire button this gives a total of 16 possible manouvers.

Both men have an energy meter which depletes with every blow sustained. When the meter reaches zero, in your case a life is lost, if you are victorious you move on to the next screen. The different screens provide varied and interesting backdrops as well as a variation in game play. On higher levels you are attacked by two opponents and certain screens require you to smash bouncing Ming vases.

The quality of the opposition is a little disappointing on the early levels, it being possible to kick your opponent half to death before he decides to take evasive action. As the higher levels are reached however, your adversary becomes a great deal more responsive.

There are 36 screens in all – I managed to complete 12 in the space of half an hour. Although the game becomes more difficult as you progress, i could not help feeling that more of a challenge in the early stages would have made a considerable improvement.

Karate £14.95
Eidersoft
The Office
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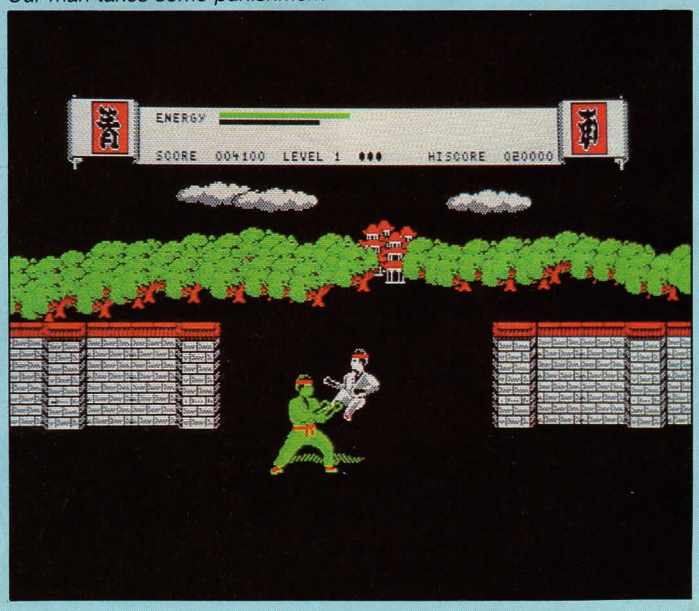
Our man takes some punishment



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THE UNPREDICTABLE MICRO

In the last instalment of our QL astrology series, John Dice shows how to calculate the positions of the outer planets.

By now, the results of April's article should be safely installed in Microdrives throughout the land. This month, I will show you how to add the outer planets to the program and discuss some of the problems and solutions to finding their positions.

As I said in part one of the series, the difference between the inner and outer planets is the extent of the perturbations which shift them from their elliptical orbits. Any solution for the outer planets which makes any claims for even modest accuracy must make allowance for those perturbations. So what are they and how do they occur? The principle is a very simple one. Remember Sir Isaac Newton and his apple? As legend has it, Sir Isaac was musing beneath an apple tree one summer's day when one of the fruit fell from the leafy boughs and struck a considerable blow to his head. Realisation then welled in Sir Isaac's throbbing pate that masses attract each other and the force of that attraction is the product of the two masses divided by the square of the distance between them. So as the planets whirl around the Sun in their orbits, held there by the force of gravitational attraction, they experience ever-changing forces in the directions of each of the other planets.

If you take any pair of planets and look at the perturbations between them, you see a wave of sometimes frightening complexity. There is much more than just one effect at work here. To start, the squashed elliptical shapes of the orbits mean that each time one planet passes another, they are invariably in different parts of their respective orbits, and at different distances from each other and from the Sun. The perturbation is thus modified at each encounter by a function describing the mutual cycle between the two planets.

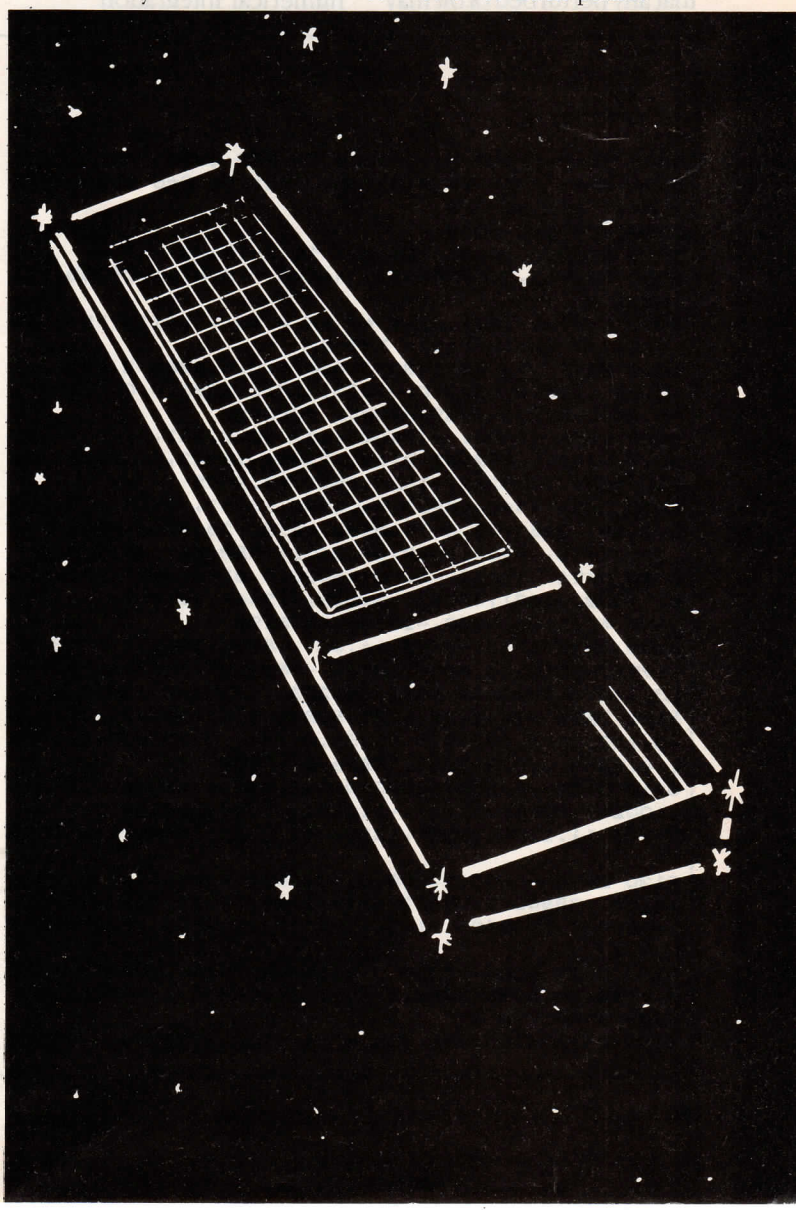
An extreme example of this kind of modification is the relationship between Neptune and Pluto. Every time Pluto nears its perihelion, it spends about 20 years just inside Neptune's orbit, and the two of them travel at very similar speeds for that period. This time round, they have spent the last 40 years in sextile, only 60 degrees apart, with Pluto being speeded and Neptune slowed. By now, they have knocked sizeable dents in each other's orbital elements and it will take several orbits of both planets for the effects of such an encounter to die down.

Jupiter and Saturn, the two heavyweights of our solar system, appear to play havoc with each other's orbits but in reality they are linked so closely that they orbit the Sun as a system in its own right. Jupiter and Saturn are trying to orbit each other but not doing so because of the Sun's superior mass.

A cause of this linking phenomenon is the resonance which occurs between the orbits of some planets. For instance, Jupiter and Saturn have orbital periods which are close to being in the ratio 2:5. So after five orbits of Jupiter and two of Saturn, their meeting is at almost the same place in their respective orbits and the perturbing effect builds up. It is rather like a singer holding the same note as a wine glass, except that the break-up of the orbit is not so dramatic. It means that the orbital elements can be described adequately only in terms of the other planet's position.

Those resonant points travel slowly round the orbits, producing large low-frequency waves called the Great Inequalities, which for Saturn and Jupiter is a 900-year cycle of almost one degree's effect on Saturn. All the outer planets display those disproportionately large perturbations of the great inequalities.

You are probably beginning to see the magnitude of the problem – a small, neat set of perturbation equations applicable to all the planets cannot exist. Each planet



makes its own peculiar demands and must be dealt with individually.

So how do we compute our way out of this jungle? The method par excellence is Numerical Integration, although it is more suitable for creating an ephemeris file on disc or Microdrive than for calculating positions on a given date. An ephemeris file is an indispensible tool for researching more flexible methods of astronomical computing and those interested in this method should read *Astronomical Papers for the American Ephemeris* Vol XXII, part 1, which gives sufficient information to generate one million years of outer planet positions. The computing time for such a task on a QL would be about a week.

Another method capable of great accuracy is the Variation of Elements method, originally due to Lagrange. The premise is that any perturbed orbit may be represented by an ellipse whose elements are changing constantly. Lagrange's Planetary Equations give the rates of change of the six orbital elements with time in response to one disturbing body. The formulae are long and complex and require integration. Recently I have encountered an interesting extension to this technique, Gaillot's method. He gives equations for the perturbations to each element in terms of the mutual cycles with neighbouring planets. Although a little long-winded, it is an efficient method to obtain results accurate to a few seconds of arc.

To generate a program of the kind I give here, the following method may be adopted. First, obtain accurate outer planet positions for the period in which you are interested. A home-made file derived by numerical integration would do, or use *A.P.A.E.* Vol. XII which gives co-ordinates from 1653 to 2060. The publication of the U.S. Government Printing Office is also available on magnetic tape, though I do not know in which format. From this data, calculate the "osculating" orbital elements of Lagrange's method using the formulae on pages 115-117 of the *Explanatory Supplement to the American Ephemeris,* published by H.M.S.O. A least-squares fit through the osculating elements will then give you mean elements already corrected for the secular or long-term perturbations. Using ellipses based on those mean elements will give about five minutes of arc accuracy over a short period of, say, 100 years.

The residual period perturbations can then be identified by Fourier analysis. This technique sorts out a complex wave into its individual frequency components and finds coefficients for the sine and cosine terms which describe them. The process can be continued until the desired accuracy is reached. The listing shown will return about one minute of arc accuracy for any date this century.

Line 2055 steers all the outer planets except Chiron to the subroutine just after the heliocentric position co-ordinates have been calculated; 3050 sets up the different numbers of correction terms there are for each planet. Then (3060) for the x, y and z co-ordinates, a secular term is assembled by SUB3000, and the pre-set number of periodic terms – less one for the z terms – are calculated and added. The formula B*5in(D) + C*Cos(D) generates a sine function of the correct amplitude and phase. The sum of the individual terms is then added to the heliocentre co-ordinates, then back to the main program.

```
2055 IF P>5 AND P<>8 THEN GO SUB 3050
3050 J=4: H=3: IF P<8 THEN J=5: IF P=6 THEN J=11
: H=2: L(3)=0
3060 FOR N=1 TO H
3070 GO SUB 3000: FOR M=1 TO J-(N=3)
3080 READ B,C,D: D=D*T: A=A+B * SIN(D)+C*COS(D):
 NEXT M
3090 L(N)=A/IE7: NEXT N: XH = XH + L(I): YH = YH
 = L(2): ZH=ZH+L(3): RETurn
5050 DATA 225.4928,3033.688,0,0,4.838E-2,-2E-5,0
,0,99.4198,1.0583,0,0,273.393,1.3383,0,0,1.3097,
-5.2E-3,0,0,5.2029:REMark JUPITER
5060 DATA 20000, -134000,127000,0,361,-22997,11.
8019,-400,-4482,41.2142,-2295,-14823,24.9146,-26
68,-5374,36.8282,11834,7481,62.9505
5070 DATA 14464,8933,44.3349,-3757,-9160,117.020
8,2488,-5460,95.6475,8453,-4551,28.8206,502,5979
,110.1442,-4134,5649,84.2401: REMark JUPITER X
5080 DATA -10000,-5000,45000,0,8593,50271,10.152
6,-1082,-4881,43.82,-22828,-12446,22.9284,5412,1
1820,41.3781,7950,-10286,62.8196
5090 DATA 5210,-8536,44.937,-8736,3981,117.0802,
-5795,-1556,95.9826,10544,-7604,24.7662,5673,-19
53,110.6417,5432,4415,84.2034: REMark JUPITER Y
5100 DATA 174.2153,1223.508,0,0,5.423E-2,-2E-4,0
,0,112.8261,.8259,0,0,338.9117,-.3167,0,0,2.4908
,-4.7E-3,0,0,9.5525: REMark SATURN
5110 DATA -14000,26000,0,0,-108694,22509,21.6805
,40024,-20569,52.97,-51652,-41086,319256,31974,-
71145,11.1806,-9982,12504,41.2491: REMark SATURN
 X
5120 DATA -9000,37000,0,0,37834,128548,21.6229,-
18138,-38546,53.0737,-37709,51711,32.032,-106666
,-109687,10.6605,-14041,-5278,43.2929:REMark SAT
URN Y
5130 DATA 6000,-2000,0,0,3454,-3615,21.8358,-118
4,4858,10.8699,2838,972,31.847,-979,204,52.3093:
REMark SATURN Z
5140 DATA 34.61278,713.5756,0,0,.3822704,-4.6407
3E-3,0,0,208.1483, 1.247724,0,0,337.4072,2.16330
7,0,0,6.91118,1.123696E-2,0,0,13.66975:REMark CH
IRON
5150 DATA 74.1757,427.2742,0,0,4.682E-2,4.2E-4,0
,0,73.5222,.5242,0,0,95.6863,2.0508,0,0,.7726,1E
-4,0,0,19.2215:REMark URANUS
5160 DATA 134000,-218600,0,0,-313837,44666,7.056
4,41655,-26742,53.0214,32524,23285,17.3398,17681
,-3373,21.8061:REMark URANUS X
5170 DATA -21000,-159000,0,0,90906,284846,7.3705
,-25456,-41868,52.9725,32942,-18943,16.4986,-200
1,-22913,21.4152:REMark URANUS Y
5180 DATA -3000,5000,0,0,4095,2869,6.1523,-811,5
85,52.8398,-999,-35,20.0765:REMark URANUS Z
5190 DATA 30.13294,240.4552,0,0,9.13E-3,-1.27E-3
,0,0,130.6842,1.1005,0,0,284.683,-21.6329,0,0,1.
7794,-9.8E-3,0,0,30.11375:REMark NEPTUNE
5200 DATA -1.122E6,1.66E6,-544000,0,42381,-25768
,52.976,895963,347521,3.091,56732,-45940,11.0113
,24454,-5198,21.5827:REMark NEPTUNE X
5210 DATA 1.832E6,-6.718E6,2.726E6,0,1.013336E6,
-1.634344E6,3.0665,20346,-120292,9.4614,-895,269
85,21.2825,-25768,-42381,52.9812:REMark NEPTUNE
Y
5220 DATA 19600,-119000,111000,0,-697,717,53.220
3,1498,-1325,15.6015,298,633,24.7226:REMark NEPT
UNE Z
5230 DATA 229.781,145.1781,0,0,.24797,2.898E-3,0
,0,108.944,1.3739,0,0,13.5366,.2086,0,0,17.1514,
-1.61E-2,0,0,39.539:REMark PLUTO
5240 DATA -603000,5.002E6,-6.126E6,0,-490000,257
,4.7817,42980,23531,52.8939,12717,23817,18.7675,
2429,-6565,24.4748:REMark PLUTO X
5250 DATA -426000,730000,-290000,0,178163,325421
,6.4926,-30969,-37972,53.2256,-71845,-80637,9.89
21,-2552,-1576,30.4822:REMark PLOTO Y
5260 DATA 145000,-928000,1.195E6,0,114138,25722,
5.2814,-14852,13094,9.2171,-1441,-1387,174603:RE
Mark PLUTO Z
```

THE P·R·O·G·S

If you've a program that is worthy of consideration, send it to 'The Progs', Sinclair QL World, 79-80 Petty France, London SW1. We pay for everything published at the usual page rates.

FCOPY – Pt 3
Rob Sherratt

The third – and final part of Rob Sherratt's fast file copy utility. The complete program adds two new commands to Super-Basic, SPOOL and SPOOL_N. SPOOL is used for file duplication, whereas SPOOL_N transfers data only and not file headers. Unlike the COPY command, control is returned to Super-Basic during a SPOOL operation – so your QL can get on with more important things in the meantime.

```
*
*   THE SPL_JOB PROGRAM WHICH PERFORMS THE BACKGROUND DATA TRANSFER
*   --------------------------------------------------------------
*
*   In order for us to have got this far, there must be 2 channels set up and
*   open for use - channel_a is the input channel, and channel_b is the output
*   channel. The SPOOL / SPOOL_N command sets up registers A0 to A2, and the
*   QDOS operating system sets up registers A4 to A6 as follows :
*
*         A0.L : Channel_id for device_a (ie read from this one)
*         A2.L : Channel_id for device_b (ie write to this one)
*         D2.L : Set to 1 for SPOOL_N and set to 0 for SPOOL
*
*         A4.L : Points to bottom of data space (relative to A6)
*         A5.L : Points to top of data space (relative to A6)
*         A6.L : Points to base of job control area
*
*
*   See if file headers have to be transferred (ie the SPOOL command rather
*   than SPOOL_N was specified).
*
SPL_JOB   TST.L     D2                  Do we omit copying headers ? ...
          BNE       DATA_XFR            ... if so start actual data transfer
*
*   Read the file header of the microdrive file_a into the buffer at address
*   specified by 0(A6,A4.L). Note that D2 and D3 which were initialised to the
*   data buffer length and timeout respectively, are not corrupted by any of
*   the file I/O calls, and so do not need to be reset.
*
          MOVE      #buffer_sp,D2       Buffer length available
          MOVE      #-1,D3              Indefinite timeout
          LEA       0(A6,A4.L),A1       Base of read buffer
          QDOS      trap3,fs_headr      Read the file header
          TST.L     D0                  Did any errors occur ? ...
          BNE.S     ERROR               ... if so, perform error handling
*
*   Write the file header to the destination channel(b). Note that D2 and D3
*   which were initialised to the data buffer length and timeout respectively,
*   are not corrupted by any of the file I/O calls, and so do not need to be
*   reset.
*
          MOVE.L    A0,-(A7)            Save channel_a id on stack
          MOVE.L    A2,A0               Set destination channel number
          LEA       0(A6,A4.L),A1       Reset to the base of the read buffer
          QDOS      trap3,fs_heads      Write the new file header
          TST.L     D0                  Did any errors occur ? ...
          MOVE.L    (A7)+,A0                (restore channel_a id)
          BNE.S     ERROR               ... if so, perform error handling
*
*   DATA_XFR : Performs the transfer of actual data. Loops until EOF, reading a
*   block from channel_a and then writing it to channel_b.
*
DATA_XFR  MOVE      #buffer_sp,D2       Buffer length available
          MOVE      #-1,D3              Indefinite timeout
          LEA       0(A6,A4.L),A1       Point to the base of the read buffer
          QDOS      trap3,io_fstrg      Read up to 64 bytes from channel_a
          CMP.L     #err_ef,D0          Was it the last block (ie EOF) ? ...
          BEQ.S     LAST_BLK            ... if so, write the last block
          TST.L     D0                  Did any other error occur ? ...
          BNE.S     ERROR               ... if so, perform error handling
*
*   Write the block just read to channel_b, then loop back to transfer more
*   data until EOF on the input channel is detected. Note that if the input
*   channel is a console device (ie  keyboard input), then pressing the ESC
*
          MOVE.L    A0,-(A7)            Save channel_a id on the stack
          MOVE.L    A2,A0               Load channel_b id ready for io_sstrg
          LEA       0(A6,A4.L),A1       Point to the base of the data buffer
          QDOS      trap3,io_sstrg      Write 64 bytes to channel_b
          MOVE.L    (A7)+,A0            Restore channel_a id
          TST.L     D0                  Did a write error occur ? ...
          BNE.S     ERROR               ... if so, perform error handling
          BRA.S     DATA_XFR            Loop until EOF(channel_a) is found
*
*   The following code is executed when EOF has been detected during the read
*   data operation from channel_a. We have to ensure that the partial data
*   block is correctly written to channel_b.
*
LAST_BLK  MOVE.L    A0,-(A7)            Save channel_a id on the stack
          MOVE.L    A2,A0               Load channel_b id ready for io_sstrg
          MOVE      D1,D2               The actual number of bytes read
          LEA       0(A6,A4.L),A1       Point to the base of the data buffer
          QDOS      trap3,io_sstrg      Write the bytes to channel_b
          MOVE.L    (A7)+,A0            Restore channel_a id
          TST.L     D0                  Did a write error occur ? ...
          BEQ.S     EXIT                ... if no error then exit normally.
*
*   Report any errors that have occurred to the user via Superbasic channel #0.
*   If channel #0 is curently awaiting input (unlikely) then channel #1 is used.
*   If the user has closed both #0 and #1 then no error is printed.
*
ERROR     NOP                           Labels aren't allowed on macro calls
          QDOS      vcall,ut_err0       Send an error message via QDOS
*
*   Commit suicide by killing our own job off ! Note that at this point the
*   data transfer has finished as far as SPL_JOB is concerned, but the QDOS
*   operating system may still be writing slave blocks to the destination
*   microdrive. Also the io channels must be closed by Superbasic (or any other
*   program)
*
EXIT      MOVEQ     #-1,D1              Specify job id for our own job
          MOVEQ     #0,D3               Generate no error message
          QDOS      trap1,mt_frjob      Force remove our own job
*
*   Having killed our own job off, we should never getto the next instruction,
*   but the tight loop is provided in case we are reactivated in error by a
*   different program
*
          BRA       *                   Go into a tight loop if we get here
*
*
*   NUM_JOBS : FUNCTION TO FIND HOW MANY JOBS ARE RUNNING UNDER SUPERBASIC
*   ----------------------------------------------------------------------
*
*   This function returns a floating point number to Superbasic indicating how
*   many machine code programs are present in the job tree headed by Superbasic
*   itself. The function only works for jobs that have been spawned directly
*   from Superbasic. If a job spawns a sub-job then only the original job will
*   be counted by the NUM_JOBS function.
```

```
*
*   A value of 0 returned by NUM_JOBS indicates that no jobs apart from Super
*   Basic exist at the moment.
*
*
*   The first thing to do is to enter supervisor mode to guarantee that the loop
*   which counts the number of jobs can execute before any of the jobs it's
*   counting decide to disappear ! If a job was to disappear, then successive
*   calls to mt_jinf would fail with "invalid job".
*
NUM_JOBS  TRAP     #0                  Set supervisor mode
*
*   Set the Superbasic Job_id so we start scanning the QDOS job list at the top of
*   the tree.
*
          CLR.L    D1                  Set job_id to Superbasic
          MOVE.L   D1,D2               Same for job at top of tree
          MOVE.L   #-1,D4              Initialise job count to -1
*
*   Scan the job tree : D1 is the next job_id in the tree which gets returned
*   after each call to mt_jinf. By feeding D1 as an input the next time mt_jinf
*   is called, we get the next one, and so on until eventually a value of 0
*   is returned which indicates we got to the end. The job count in D4 is
*   incremented as we go round the loop.
*
JOB_LOOP  ADDQ     #1,D4
          BMI.S    P_ERROR             Program error causing infinite loop
          QDOS     trap1,mt_jinf       Get job information
          TST.L    D0
          BNE.S    J_ERROR             Error if job doesn't exist
          TST.L    D1                  Are there any more jobs ? ...
          BNE.S    JOB_LOOP            ... if so count them
*
*   We are not worried if QDOS does a task level interrupt now, because the
*   number of jobs have been counted. Hence reset the supervisor bit in the
*   status register (we have privilege).
*
          EORI     #ss,SR              Reset supervisor status bit
*
*   Reserve 6 bytes of storage space on the arithmetic stack ready to store the
*   floating point return parameter.
*
          MOVEQ    #6,D1               Number of bytes required = 6
          QDOS     vcall,bv_chrix      Reserve arithmetic stack space
          MOVE.L   bv_rip(A6),A1       Set the arithmetic stack pointer
*
*   D1 is zero, indicating there are no more jobs to be counted. Return the
*   current value of D4.W to Superbasic via the arithmetic stack which is
*   addressed via 0(A6,A1.L). We do this by converting from integer to floating
*   point representation (via ri_float arithmetic) first.
*
          SUBQ.L   #2,A1               Predecrement the arith. stack pointer
          MOVE     D4,0(A6,A1.L)       Store integer on stack
          MOVE     #ri_float,D0        Specify integer to floating point
          QDOS     vcall,ri_exec       Execute arithmetic utility program

          MOVE.L   A1,bv_rip(A6)       Save the new stack pointer
          MOVEQ    #2,D4               Return argument is floating point type
          RTS                          Normal exit to Superbasic
*
*   P_ERROR : program error causing infinite loop
*
P_ERROR   MOVEQ    #err_bp,D0          Generate parameter error message
*
*   J_ERROR : an error in the NUM_JOBS function has occurred which will be
*   reported to Superbasic via register D0 which already contains the error
*   code.
*
J_ERROR   RTS                          Error exit to Superbasic
*
          END
```

MDV Executive
Greg W Harris

This microdrive utility performs many of the housekeeping functions available on more sophisticated, but expensive commercial software.

The program is menu driven and simplicity itself to use. A numbered directory is provided from which files can be microdrive copy, delete, format, and print.

```
100 REMark "MDV EXECUTIVE" written by Greg W. Ha
rris; November -December 1985
110 execu
120 menu
130 REMark ************************************
***** execu
140 DEFine PROCedure execu
150  DIM files$(200,12)
160  windows
170  OPEN_NEW #6,'mdv1_direct'
180  DIR#6;'mdv1_'
190  CLOSE#6
200  read_file
210 END DEFine execu
215 REMark ************************************
************  read_file
220 DEFine PROCedure read_file
230  OPEN #6,'mdv1_direct'
240  INPUT #6,di$
250  LET count = 1
260  REPeat loop
270   INPUT #6,di$
280   IF di$<>'direct'THEN
290    LET files$(count)=di$
300    LET count = count +1:END IF
310   IF EOF (#6):EXIT loop:END IF
320  END REPeat loop
330  CLOSE #6:  DELETE 'mdv1_direct'
340 END DEFine read_file
350 REMark 340
360 REMark ************************************
********************* windows
370 DEFine PROCedure windows
380  OPEN #7, scr_512x51a0x0
390  PAPER#7,4:CLS #7
400  INK #7,0:CLS #7
410  REMark SET UP LOWER AREA OF SCREEN
420  OPEN #8,con_327x203a185x51
430  PAPER#8,7:INK #8,0:CLS #8
440  REMark set up directory window (9)
450  OPEN#9,scr_184x203a0x51
460  PAPER#9,3:CLS#9
470 END DEFine windows
480 REMark ************************************
******************  menu
490 DEFine PROCedure menu
500 CLS#8
510  REPeat loop
520   CLS#7
530   CSIZE #7,2,1:AT#7,1,7:PRINT #7,,"MDV EXECU
TIVE"
540   AT#8;2,0
550   PRINT #8,,"1      List/scroll directory for
 MDV1"
560   PRINT #8\\,"2      Load file from MDV1"
570   PRINT #8\\,"3      Delete a file on MDV1"
580   PRINT #8\\,"4      Copy a file from MDV1 to
 MDV2"
590   PRINT #8\\,"5      Hard copy of MDV1 direct
ory"
600   PRINT #8\\,"6      Format cartridge in MD2"
610   PRINT #8\\,"7      Duplicate all MDV1 to MD
V2"
620   PRINT #8\\,"8      SuperBASIC"
630  REPeat check
640   WAIT
650   numcheck
660   IF 1=1num THEN EXIT check
670  END REPeat check
680  IF ok$>"0" AND ok$< "9" THEN LET a =ok$
690   ELSE LET a =8:END IF
700   SELect ON a
710    ON a=1:cat
720    ON a=2:LLOAD
730    ON a=3:del
740    ON a=4:ccopy
750    ON a =5:hard
760    ON a=6:fFORMAT
770    ON a=7:dup
780    ON a=8:windows:STOP
790   END SELect
800  END REPeat loop
810 END DEFine menu
820 REMark ************************************
******************  cat
830 DEFine PROCedure cat
840  CLS #7:CLS#9:AT#9,1,2
```

```
850  CSIZE#9,1,1: PRINT#9,'Directory of MDV1'!!\
860  AT#7,1,2:CSIZE #7,1,1
870  PRINT #7,'hit any key to pause- or<ESCAPE>'
880  FOR a = 1 TO count -1
890  CSIZE#9,0,0: PRINT #9,,a!files$(a)
900  LET a$ = INKEY$:IF CODE (a$)=27 THEN RETurn

910  IF CODE (a$) >0:  PAUSE
920  END FOR a
930  CLS#7: CSIZE#7, 1,1: AT#7;1,2:PRINT #7;"Hit
 any key to continue          "
940 END DEFine cat
950 DEFine PROCedure PAUSE
960  CLS#7: AT#7,2,2:CSIZE #7,1,1
970  PRINT #7, "hit any key to continue"
980 END DEFine PAUSE
990 REMark ************************************
******************  hard
1000 DEFine PROCedure hard
1010  BAUD 9600:OPEN#5;SER1
1020  DIR #5;mdv1_
1030 END DEFine hard
1040 CLS #8
1050 REMark ************************************
****************  del
1060 DEFine PROCedure del
1070 REPeat check
1080  CLS#8:AT#8,3,3
1090  INPUT #8;,"ENTER NUMBER OF FILE TO BE DELE
TED:";ok$
1100  numcheck:
1110  IF l=lnum THEN
1120   IF ok$< count AND ok$>1 THEN EXIT check
1130   ELSE
1140  END IF
1150  ELSE
1160 END IF
1170 END REPeat check
1180  LET a$=files$(ok$)
1190  LET a$=a$(1 TO LEN(a$))
1200  PRINT #8:PRINT#8,," PRESS Y IF THE FILE NA
ME IS  ";a$
1210  LET n=ok$
1220  WAIT
1230  IF ok$<>"y" AND ok$<>"Y" THEN del
1240   LET files$(n)=""
1250   DELETE 'mdv1_'&a$
1260   CLS#8: IF n=count-1 THEN count =count-1
1270  END IF
1280  CLS #8:cat
1290 END DEFine del
1300 REMark ************************************
******************  ccopy
1310 DEFine PROCedure ccopy
1320  REPeat check
1330   CLS#8:AT#8,3,1,
1340   INPUT #8;,"ENTER NUMBER OF FILE TO BE COP
IED :";ok$
1350   numcheck
1360   IF l=lnum THEN
1370    IF ok$<count AND ok$>1 THEN EXIT check
1380   ELSE
1390   END IF
1400  ELSE
1410  END IF
1420 END REPeat check
1430 LET a$=files$(ok$)
1440 PRINT #8:PRINT #8,,"PRESS 'Y' IF FILE NAME
IS ";a$
1450 LET n= ok$
1460 WAIT
1470 IF ok$<>"Y" AND ok$<>"y" THEN ccopy
1480   COPY 'mdv1_'&a$ TO'mdv2_'&a$
1490  END IF
1500 CLS#8:END DEFine ccopy
1510 REMark ************************************
****************  numcheck
1520 DEFine PROCedure numcheck
1530  LET l=LEN(ok$):LET lnum=0
1540  FOR a =1 TO l
1550   IF ok$(a)INSTR"1234567890" THEN LET lnum=
lnum+1
1560  END FOR a
1570 END DEFine numcheck
1580 REMark ************************************
******************  fformat
1590 DEFine PROCedure fFORMAT
1600  CLS#7:CLS#8:CLS#9:CSIZE#7,2,1:CURSOR#7,164
,20:PRINT#7;"FORMAT IN MD2"
1610  CSIZE#8,3,1:AT#8,4,4:PRINT#8,'ARE YOU SURE
?':BEEP 25000,4000
1620  WAIT
1630  IF ok$<>"y" AND ok$<>"Y" THEN CLS#8:CSIZE#
8,0,0:menu
1640 END IF
1650 REPeat length
1660   CLS#8:CSIZE#8,0,0:AT#8,4,3:INPUT#8;"ENTER
 NAME OF CARTDRIDGE TO BE FORMATTED,(max 10
 letters) :";f$
1670   IF LEN(f$)<11 THEN EXIT length
1680  END REPeat length
1690 REPeat loop
1700  CLS#8:AT#8,3,1
1710  INPUT#8,,'How many times do you want MDV2
formatted?';ok$
1720  numcheck
1730  IF l=lnum THEN EXIT loop
1740 END REPeat loop
1750  CURSOR#7,244,20:PRINT #7;">          "
1760  FOR n=1 TO ok$
1770   FORMAT 'mdv2_'&f$
1780  NEXT n
1790  windows
1800  menu
1810 END DEFine fFORMAT
1820 REMark ************************************
**********************  lload
1830 DEFine PROCedure LLOAD
1840  REPeat loop
1850   CLS#8:AT#8,3,1
1860   INPUT#8,,'ENTER NUMBER OF FILE TO BE LOAD
ED:';ok$
1870   numcheck
1880   IF l=lnum THEN
1890    IF  ok$<count AND ok$>1 THEN EXIT loop
1900    ELSE
1910   END IF
1920   ELSE
1930   END IF
1940  END REPeat loop
1950  LET a$=files$(ok$)
1960  CLS#8:AT#8,3,1:PRINT #8,,"PRESS 'Y' IF FIL
E TO LOADED IS"!a$
1970  WAIT
1980  IF ok$ <>"y"AND ok$<>"Y" THEN  LLOAD
1990  LOAD 'mdv1_'&a$
2000 END DEFine  LLOAD
2010 REMark ************************************
**********************  dup
2020 DEFine PROCedure dup
2030  CLS#8:AT#8,3,1
2040  PRINT#8!'Place the cartridge you wish to b
e duplicated in MDV1 and then press any key'
2050   WAIT
2060   execu
2070   LET pos="/" INSTR files$(1)
2080   LET s=(files$(1) (pos+1 TO pos+3))-(files
$(1) (1 TO pos-1))
2090   PRINT #8!\\'You need'!s;' sectors free on
 your back-up cartridge.'\'If you need to FORMAT
 a new cartridge for the back-up then place the
cartridge in MDV2 and press "F". If youhave enou
gh free sectors then press any other key.'
2100   WAIT
2110   LET se =CODE(ok$)
2120   SELect ON se
2130    ON se=70:fFORMAT
2140    ON se=102:fFORMAT
2150   END SELect
2160   FOR n=2 TO count-1
2170    COPY 'mdv1_'&files$(n) TO 'mdv2_'&files$
(n)
2180   END FOR n
2190   menu
2200 END DEFine dup
2210 REMark ************************************
**********************  wait
2220 DEFine PROCedure WAIT
2230  LET ok$=""
2240  REPeat WAITR: LET ok$= INKEY$:IF ok$<>"" T
HEN EXIT WAITR
2250 END DEFine WAIT
2260 REMark ************************  END PROGRAM
 ************************
```

Mushyman
J M Dower

Another variation on a favourite theme from games impressario J M Dower, author of Hungry Harry in April's *Sinclair QL World*. This time you must eat all the blue mushrooms to gain a time bonus. Beware of the green mushrooms which are poisonous. Type in DEFCHAR before running the program to set up the special graphics. Part 2 follows next month.

```
10 REMark ****************
20 REMark *    MUSHYMAN    *
30 REMark *   PROGRAMMED   *
40 REMark *     FOR  THE   *
50 REMark * SINCLAIR  QL  *
60 REMark *   BY J.DOWER   *
70 REMark ****************
80 :
100 init
110 map
120 screen_init
125 title
130 mushrooms
140 EXTRA_MUSHES
145 :
155 DEFine PROCedure init
160 PAPER #0,0:CLS #0:PAPER 0:CLS:INK 4
170 AT 5,9:PRINT "INPUT LEVEL OF PLAY":AT 7,9  :
PRINT  "1 (EASY) - 8 (HARD)"
180 AT 9,9:INPUT level$
190 IF level$="" THEN GO TO 170
200 level=level$
210 IF level<1 OR level>8 THEN GO TO 170
220 CLS
230 lives=5:score=0:target=0:bonus=5000:dir$="s"
240 fq=-1*level
250 gq=fq+11
260 freq=gq*10
270 END DEFine init
280 :
290 key=KEYROW(1)
300 x=2:y=2
310 moveman
320 REPeat loop
330 FOR innerloop=1 TO freq
340 IF innerloop=1 THEN newmush " "
350 xx=x:yy=y
360 key=KEYROW(1)
370 IF key THEN moveman
380 IF dir$="left" THEN moveleft
390 IF dir$="right" THEN moveright
400 IF dir$="up" THEN moveup
410 IF dir$="down" THEN movedown
420 c$=scr$(y,x)
430 IF c$="+" THEN EXIT loop
440 IF c$=" " THEN AT y-1,x-1:PRINT " "
450 IF c$="*" THEN BEEP 5000,266,100,1,7:AT y-1,
x-1:PRINT " ":scr$(y,x)=" ":score=score+50:AT #0
,1,13:PRINT #0,score:target=target-1:AT #0,3,22:
PRINT #0,target;" "
460 IF target=0 THEN clearsheet
470 x=xx:y=yy
480 INK 3:AT y-1,x-1:PRINT "@"
490 AT #0,3,8:PRINT #0,bonus;" "
500 IF bonus>0 THEN bonus=bonus-10
510 NEXT innerloop
520 END REPeat loop
530 :
540 FOR N=1 TO 20
550 BEEP 0,N,N*484,N+54,0,N
560 INK N:AT y-1,x-1:PRINT"@"
570 NEXT N
580 AT y-1,x-1:INK 6:PRINT "$"
590 BEEP
600 lives=lives-1
610 AT #0,1,28:PRINT #0,FILL$ (CHR$(124),lives)&
" "
620 IF lives>0 THEN GO TO 300:ELSE game_over
630 :
640 DEFine PROCedure clearsheet
650 BEEP 0,1,254,3,1
660 RECOL 0,0,4,0,2,0,7,0
670 BEEP
680 IF bonus=0 THEN GO TO 750
690 FOR m=bonus TO 0 STEP -50
700 AT #0,3,8:PRINT #0,m;" "
710 BEEP 200,0
720 score=score+50:AT #0,1,13:PRINT #0,score
730 NEXT m
740 IF m<>0 THEN score=score+m:bonus=0:AT #0,3,8
:PRINT #0,bonus;" ":AT #0,1,13:PRINT #0,score
750 FOR N=1 TO 20
760 SCROLL -10
770 NEXT N
780 IF freq>40 THEN freq=freq-10:ELSE freq=freq-
5
790 level=level+1
800 bonus=5000
810 AT #0,3,34:PRINT #0,level;" "
820 GO TO 110
830 END DEFine clearsheet
840 :
850 DEFine PROCedure moveman
860 IF key=64 THEN hypermush
870 IF key=16 THEN dir$="right"
880 IF key=2 THEN dir$="left"
890 IF key=4 THEN dir$="up"
900 IF key=128 THEN dir$="down"
910 END DEFine moveman
920 :
930 DEFine PROCedure hypermush
940 AT y-1,x-1:PRINT " "
950 yy=RND(2 TO 19):xx=RND(2 TO 36)
960 IF scr$(yy,xx)<>" " THEN GO TO 950
970 BEEP 500,1
980 END DEFine hypermush
990 :
1000 DEFine PROCedure moveright
1010 c$=scr$(y,x+1)
1020 IF c$<>"#" THEN xx=x+1
1030 dir$="right"
1040 END DEFine moveright
1050 :
1060 DEFine PROCedure moveleft
1070 c$=scr$(y,x-1)
1080 IF c$<>"#" THEN xx=x-1
1090 dir$="left"
1100 END DEFine moveleft
1110 :
1120 DEFine PROCedure moveup
1130 c$=scr$ (y-1,x)
1140 IF c$<>"#" THEN yy=y-1
1150 dir$="up"
1160 END DEFine moveup
1170 :
1180 DEFine PROCedure movedown
1190 c$=scr$(y+1,x)
1200 IF c$<>"#" THEN yy=y+1
1210 dir$="down"
1220 END DEFine movedown
1230 :
1240 DEFine PROCedure mushrooms
1250 FOR N=1 TO 60
1260 blox=RND (2 TO 19):bloy=RND (2 TO 36):IF sc
r$(blox,bloy)<>" " THEN GO TO 1260
1270 IF blox=2 AND bloy=2 THEN GO TO 1260
1280 IF RND(1 TO 10)=5 AND scr$(blox,bloy)=" " T
HEN INK 1:AT blox-1,bloy-1:PRINT "+":scr$(blox,b
loy)="*":target=target+1:AT #0,3,22:PRINT #0,tar
get;" ":BEEP 100,15:GO TO 1310
1290 scr$(blox,bloy)="+"
1300 AT blox-1,bloy-1:INK 4:PRINT "+":BEEP 100,3
0
1310 NEXT N
1320 END DEFine mushrooms
1330 :
1340 DEFine PROCedure newmush (thing$)
1350 mushx=RND (2 TO 19):mushy=RND(2 TO 36)
1360 IF scr$(mushx,mushy)<>thing$ THEN GO TO 135
0
1370 AT mushx-1,mushy-1:INK 1:PRINT "+":scr$(mus
hx,mushy)="*":BEEP 100,15:target=target+1:AT #0,
3,22:PRINT #0,target;" "
1380 END DEFine newmush
1390 :
1400 DEFine PROCedure EXTRA_MUSHES
1410 FOR N=1 TO 11-level
1420 newmush "+"
1430 NEXT N
```

MICRODRIVE EXCHANGE

In return for a small administration charge (per program — including a royalty for the author), we will copy onto blank microdrives any or all of the featured programs.

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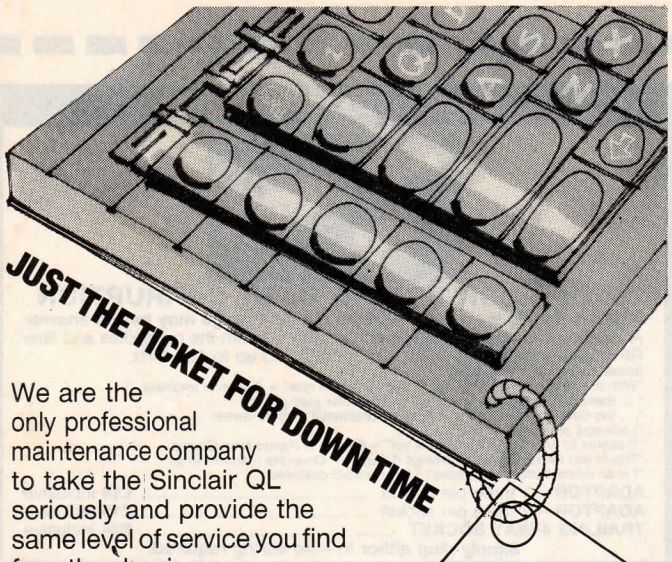

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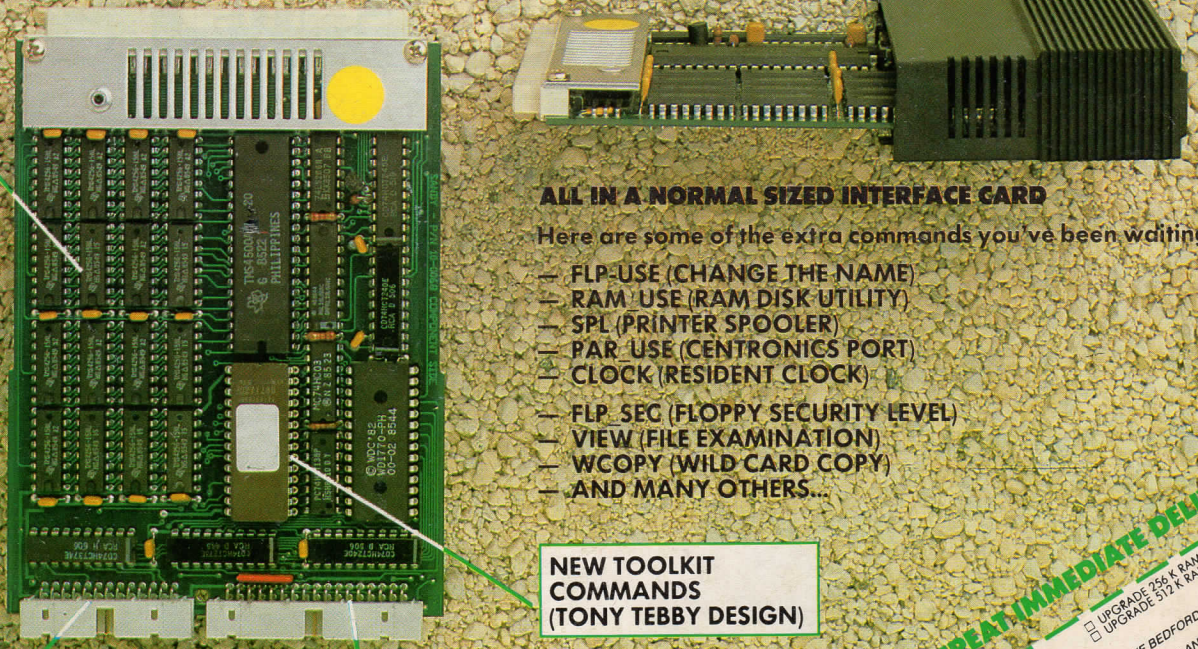

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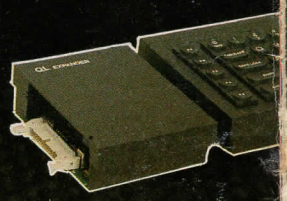

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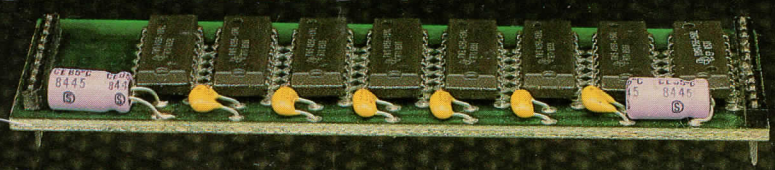

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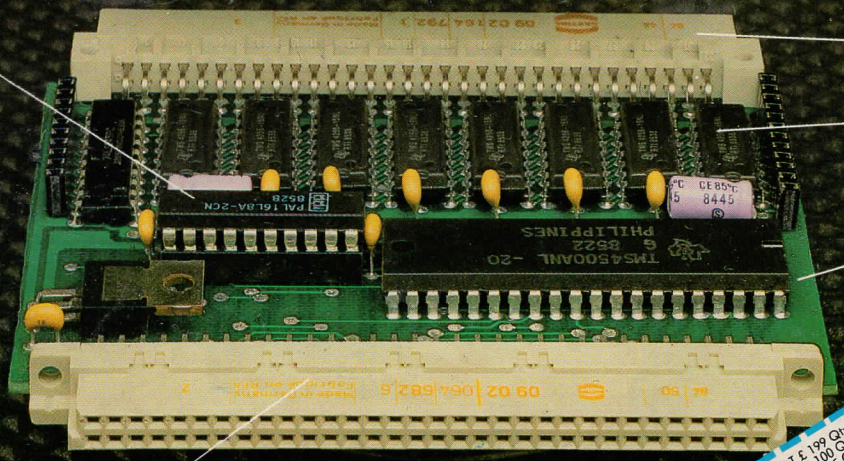

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