SPECTRUM USER

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Anger growing over delays in delivery

ANGER is growing among the many people still waiting for their Spectrums up to 10 weeks after placing their orders. Accusations have been made that the customer service department at Sinclair Research has been quoting 28 days' delivery for new orders, despite knowing they could not be met.

One person who contacted *Sinclair User* said that on the basis of the department's assurances he had ordered a Spectrum for his son's birthday. "He sold his ZX-81 expecting to have his Spectrum and then the order was returned when Sinclair said it could not meet the delivery date," he said.

Ronald Harris of Swansea said he had been waiting since the end of May. "I have the feeling I am just being strung along and that I haven't been told the truth. I wouldn't mind so much if I was told how long it would be but to keep telling me it will be another three weeks is not right.

"What annoys me is that it will be about three months from order when I get my Spectrum but the order forms still say to allow 28 days for delivery."

A spokesman for Sinclair Research said that the company regrets the delays, which were now about eight weeks for new orders. He added that the problems had been caused by the level of response, which is much higher than expected.

The launch of the Spectrum had been based on the experience of the ZX-81 but order levels had been even higher.

Based on the latest information, which is changing from day to day, it is estimated that delivery time should be down to 28 days by the end of September. In the meantime, the spokesman said that the company will be notifying people regularly of the position.

He added that if customers telephone the distribution depot quoting their order, they should be able to receive some idea of when the order would be despatched but it would not be possible to give an exact date.

Launch of new software range

A RANGE of software for the Spectrum is being published in September. Sinclair Research has been putting together the range from the products of a number of software houses.

A spokesman for Sinclair says that a number of software manufacturers have made presentations in the last few months and the range is now ready to be released.

Education sales boost

SINCLAIR Research has at last been given some recognition by the Government. The Spectrum has been included in the Department of Industry Micros in Primary Schools scheme.

Under the scheme, schools wishing to take the Spectrum will get a grant of 50 percent of the cost. In total, the scheme is worth up to £9 million and runs from the beginning of October to the end of 1984.

The other machines included in the scheme are the BBC Model 'B' and Research Machines Link 480-Z.

Clive Sinclair said following the announcement that he welcomed the move and thought the Spectrum was the ideal machine for the market.

A spokesman for Sinclair Research added that it was difficult to judge what it would mean for the company but if it achieved one-third of the market, which includes 27,000 schools, it would be doing well.

The Spectrum is the cheapest package of the three available with a full system including a cassette recorder, a colour monitor and an initial teacher training pack costing £346. The BBC was priced at £540 and the 480-Z at £818.

U.S. has to wait for Spectrum

THE U.S. will have to wait until the new year at the earliest before it will see the Spectrum. Nigel Searle, head of Sinclair Research computer division, has said that the company is making sure that production is adequate before entering new markets.

That followed the experience last year with the ZX-81 when it was put into WH Smith and launched in the States shortly before Christmas. That, combined with a big Christmas demand in Britain, resulted in delivery delays.

Sinclair moves on telesoftware

SINCLAIR RESEARCH intends to move into the telesoftware market early next year. It is developing a Prestel adaptor for the Spectrum which will sell for "well under £100 and allow users to load programs direct from Prestel."

It is also considering an adaptor which will allow users to input information into Prestel.

The first adaptor will be based on Martochoice hardware which shared first prize in the competition organised by Prestel to find an adaptor for the ZX-81. Martochoice is acting as consultant in the development for the Spectrum.

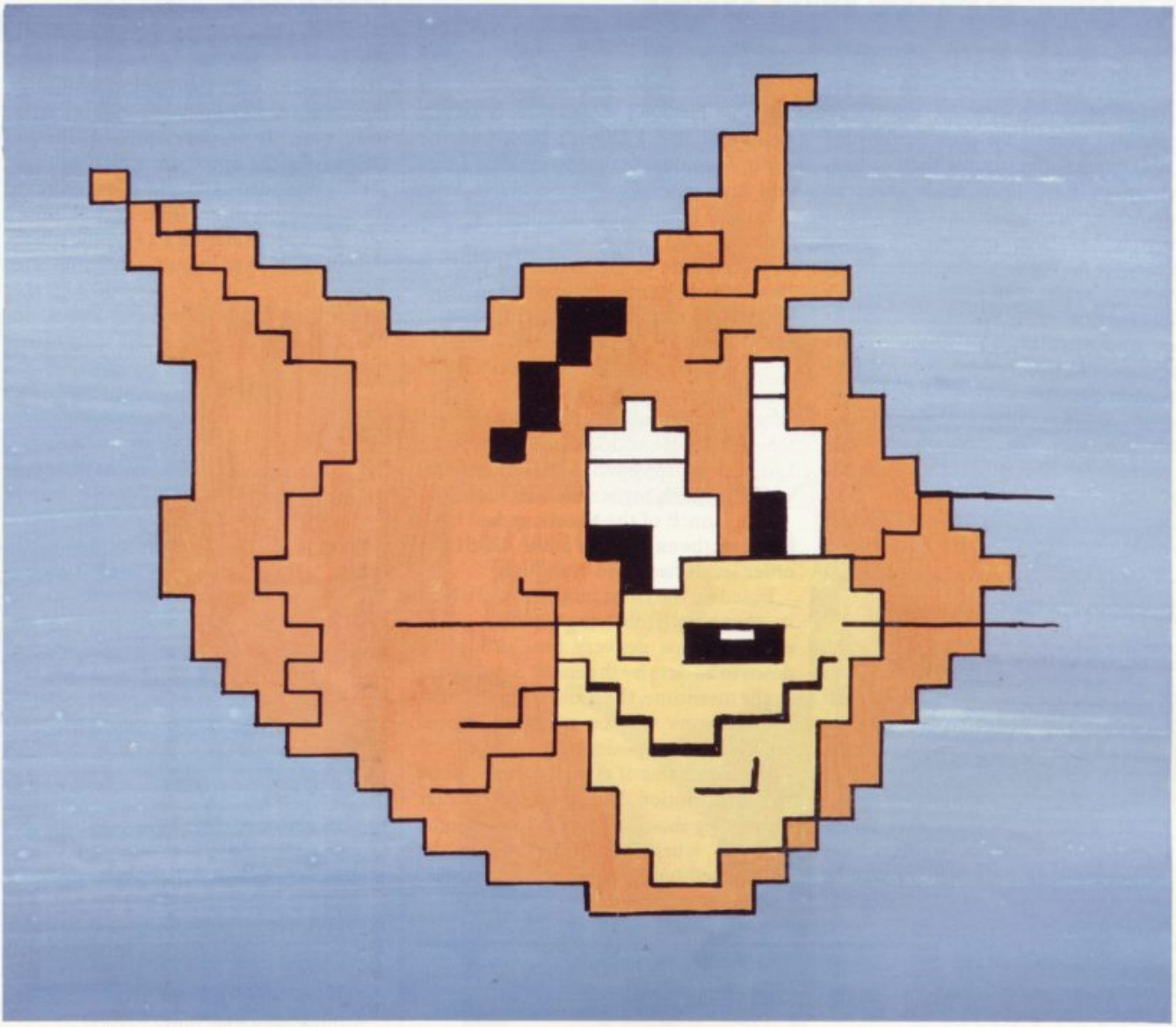
NIGEL SEARLE
'Telesoftware can beat the pirates'

Announcing the move, Nigel Searle, head of the computer division of Sinclair Research, said that software would be the market in which to make profits in the future. "The prices of hardware products will be driven down by the competition from the Japanese," he said.

There were, however, problems with the present system of software distribution. It was subject to piracy and distributors could never be sure which cassettes would sell, with the possibility of having unsold stocks remaining on the shelves.

"By transmitting software by teletext or viewdata, those problems are overcome, with the bonus that it can be updated quickly," Searle said.

He refused to say how much the adaptor may cost, except that it would be well below £100. The Martochoice model was expected to sell for about £80 but it is understood that the Sinclair version will be using advanced components which could reduce the cost.



Ian Stewart puts new colour into an old ZX-81 cat game.

Spectrumtalk primer

IT LOOKS as if Uncle Clive has done it again. I did not buy the ZX-80, because someone told me it only had integer Basic, and I have an interest in number-crunching. I bought the ZX-81 and, while it had its idiosyncracies, it did what I wanted it to do, and a good deal more, with a definite panache, and inexpensively.

"The motorbike of computers", a rival manufacturer called it, admiringly, and indeed it was. It sold half a million in a year.

Now the Spectrum; that is something special. In a way, the most impressive thing about it is that all those features of the ZX-81 which one has learned to love and live with — touch-sensitive keyboard, volume-sensitive LOADing, and auto-detachable RAM pack — have been improved to the point of impeccability. Let no-one suggest that Sinclair does not listen to criticisms.

Of course, the Spectrum is no Cray-1 but at its price it is unbeatable value. It is a very powerful little beast. I have had mine for three weeks and barely scratched the surface. The question of reliability remains moot — three weeks is not sufficient to tell but, by and large, if they work at all, they work forever.

I am going to assume that, like me, you took the ZX-81 route; what you want to know is what does the Spectrum do which the ZX-81 will not?

First, it will do everything the ZX-81 does — four times as fast. That is because the screen display has its own electronics, so it is like a ZX-81 which is permanently in FAST mode but keeps the screen display going. Moving graphics, even in Basic, can be fast enough for a good video game.

To that increased speed, add colour — black, white, and six real ones like magenta and green; sound bleeps of varying length and pitch; hi-res graphics — 256 by 176, good enough for some really fancy curves and some remarkably powerful commands which draw lines and circles at the drop of a hat; SAVEing and LOADing which work like a charm — fast, reliable, helpful messages. My co-author Robin Jones made a tape on his

Spectrum using his cassette-player and it LOADed into my Spectrum from my cassette-player first time; user-defined functions — DEF FN A(x,y,z) = SQR (x*x + y*y + z*z) and you are ready to do three-dimensional geometry, easily; user-defined graphics; multi-statement lines.

Sorry, but I am carried away. It is good. Flexibility is the watchword. There are features I do not like; for instance, DRAW x,y draws a line from the current position to one which is offset distances x and y horizontally and vertically. I would prefer it to draw to co-ordinates x,y — too bad. A quick PEEK at the system variables COORDS and you have the DRAW command you want anyway.

There a keyboard click which is barely audible, to tell you that the machine has noticed the keyboard has been pressed; POKE 23607,50 and you have a real bleep which can be heard. Roughly speaking, what does not suit you you can change. You can even POKE the pointer to the character set and define an entire new alphabet in RAM.

Even the manual has difficulty describing all the features of the Spectrum, so I cannot possibly condense them here. Instead, let me describe just one — the user-defined graphics characters.

I have put together a book of programs for the ZX-81 and Spectrum* which implements a variety of puzzles on the TV screen, with moving graphics and user-controlled actions. I will take you through one of them.

It presents you with a line of cats, numbered 1-7 in order — the 7 is negotiable with a blank at the left-hand end. You have to re-arrange them into the order 7654321. A cat may move into the space if it is adjacent to it; or it may hop over one cat into the space. You choose which cat to move and continue until they are re-arranged. The space has to finish on the left, where is started. The ZX-81 version is shown in figure one.

It works well; the only trouble is that the cats are only letter Cs. Would it not be pleasant to make them look like real cats? On the Spectrum, you can do it. First, you draw a cat on an 8x8 grid as shown in figure two.

Then you convert the black squares to 1s and the blanks to 0s and imagine each row of the picture as an eight-digit binary number. So the top line is 01001010, and so on. In decimal, that is 74. Doing that for all eight rows gives numbers, in decimal, 74,122, 122,50, 250,254,124,0.

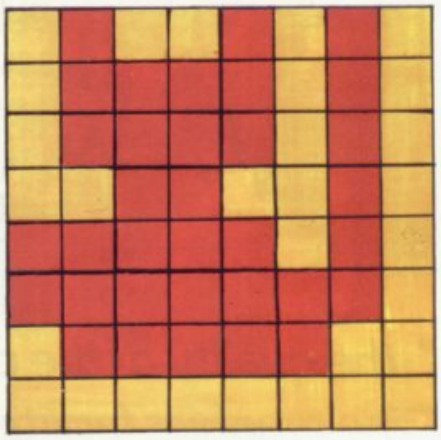
Then you can set up the user-defined graphics character C in graphics mode, as follows:

```
500 DATA 74, 122, 122, 50, 250, 254, 124, 0
```

Figure 1.

```
  10 LET P=0
  20 DIM W(9)
  30 FOR I=1 TO 9
  40 LET W(I)=I
  50 NEXT I
 100 PRINT AT 0,0;"HOW MANY CATS
?"
 105 INPUT C
 110 LET N$=" 1 2 3 4 5 6 7 8 9"
 120 PRINT AT 16,6;"■"→N$( TO 2*
C)
 130 FOR I=1 TO C
 140 PRINT AT 14,6+2*I;"*"
 150 NEXT I
 200 PRINT AT 0,0;"MOVE WHICH CA
T?"
 205 INPUT A
 210 IF A<1 OR A>C THEN GOTO 200
 212 PRINT AT 0,0;"(14 SPACES)"
 215 IF ABS (W(A)-P)>2 THEN GOTO
 200
 220 PRINT AT 16,6+2*P;A;AT 14,6
+2*P;"*";AT 16,6+2*W(A);"■";AT 1
4,6+2*W(A);" "
 224 LET R=W(A)
 225 LET W(A)=P
 230 LET P=R
 240 FOR J=1 TO C
 250 IF W(J)+J<>C+1 THEN GOTO 20
0
 260 NEXT J
 265 IF P>0 THEN GOTO 200
 270 PRINT AT 8,12;"CATS SWAPPED
"
 280 STOP
```

Figure 2.



```
510 FOR t = 0 TO 7
520 READ x
530 POKE USR "C" + t,x
540 NEXT t
```

RUN 500 then ensures that every time you hit key C in graphics mode, the result is a tiny pussycat.

Having done that you take the ZX-81 version of the program and change lines 140 and 220 so that C is replaced by C in gaphics mode. To do that, press CAPS SHIFT and key 9 — graphics — before hitting the C. For a little of *son et lumiire,* jazz up the commands a little and the cats turn green:

```
140 PRINT AT 14,6 + 2*I; INK 4;
    "gC"; INK 0
220 PRINT AT 16,6 + 2*P;A;AT
    14,6 + 2*P; INK 4; "gC"; INK 0;
AT 16,6 + 2*W(A);
"□"; AT 14,6 + 2*W(A); "[ ]"; BEEP
    .1,A
```

Here □ is inverse video space graphics 8 on CAPS SHIFT and [ ] is a space. "gC" is "C" in graphics mode. The beep is for fun; the colon is a multi-statement line device.

If you have a Spectrum, type the above, include lines 500-540; change 140 and 220 as shown. You can use lower — case for all variables. RUN 500, then RUN.

That is just one feature. There are many more. For an easy introduction, Jones and I have just written a book which includes about 30 pre-packed programs, plus descriptions of the main features, plus a program called **Character Builder** to set up user-defined characters and design them large-scale on the screen. There is room here for a listing.

* **Computer Puzzles:** Shiva Publishing, 4 Church Lane, Nantwich, Cheshire.
Easy Programming for the Spectrum: Shiva Publishing.

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Transferring programs

Andrew Hewson answers the first batch of your Spectrum problems

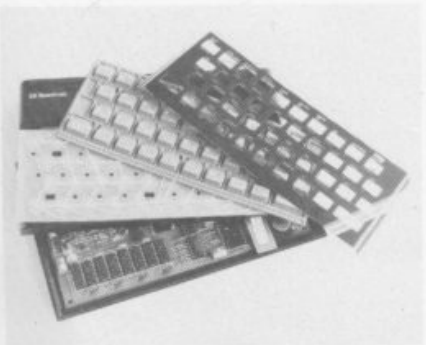
I HAVE received a number of letters about the ZX Spectrum and the editor has asked me to devote a special column to them. A question which several people have posed, including Paul Tuck of Swindon, is: **Can I use ZX-80/1 programs on my Spectrum?**

There is no straightforward answer, because of a number of important differences between the three machines. Broadly speaking, a ZX-81 program which does not use PEEK or POKE and contains its machine code routines will run on the Spectrum. Similarly, a Spectrum program which does not use PEEK or POKE, machine code routines, colour, graphics and the other new facilities will run on the ZX-81. Note, however, that cassettes SAVEd on one machine will not load on the others.

Coverting a ZX-80 program can be difficult, because it uses integer arithmetic, whereas the ZX-81 and Spectrum use real arithmetic.

Can you explain how the display file works? I have tried PEEKing and POKEing it but I still cannot understand it, writes Sam Peters of Solihull.

Look at pages 164 and 165 of the ZX Spectrum Basic programming manual. You will see from the memory map that the display file is at the bottom of RAM between 16384 and 22527 inclusive,



with the so-called attributes area at 22528 to 23295. A quick calculation shows that there are 6,144 bytes in the display file and as there are 32 characters in each of 24 lines displayed on the screen, that means that there are eight bytes per character. You can see how those bytes are used by running this program:

```
9000 FOR i = 16384 TO 22527
9010 POKE i, 255
9020 NEXT i
9030 PAUSE 0
```

The screen will be covered gradually with black horizontal lines. Notice that each line is separated by eight vertical steps from its predecessor, that lines are drawn in groups of eight, and that at the end of each group the next line is drawn back at the beginning of the group. There are three such groups.

In effect, the display is in three separate units and within each unit the first 256 bytes determine the condition of the top one-eighth of each character position. The next 256 bytes determine the next one-eighth of each character position, and so on.

The attributes area is 768 bytes long, i.e., one byte per character position. It is scanned in the logical fashion so that to POKE the fifth character on the second line of the display, for example, you POKE 22527 = 32 = 5. The attribute byte specifies, among other things, the foreground and background colour, so you can only obtain, at most, two colours per character position.

Hence you cannot expect to obtain high-resolution graphics in multiple colours. This routine demonstrates the full range of facilities. It takes some time to produce the display but it is worth it in the end:

```
9000 FOR i = 16384 TO 20480
  STEP 2048
9010 FOR j = i TO i + 2047
9020 POKE j, 7
9030 NEXT j
9040 NEXT i
9050 FOR i = 22528 to 23295
  STEP 256
9060 FOR j = 0 TO 255
9070 POKE i + j, j
9080 NEXT j
9090 NEXT i
```

If you are impatient, replace the first five lines by

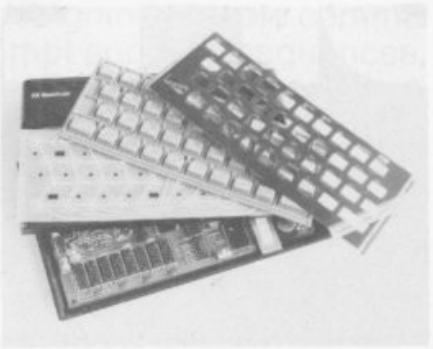
```
9000 FOR i = 1 TO 704
9010 PRINT "□": REM
  CHARACTER NUMBER 138
9020 NEXT i
```

for the same effect but with the bottom two lines missing.

David Jones of Leeds makes an interesting point concerning the raising of numbers to powers. He writes: **If you square variables which are negative you get an error message. Surely that should not happen?**

You can see what he means if you run the routine:

```
10 LET a = -3
```



```
20 PRINT a ↑ 2
```

That gives an error message "Invalid argument", which is better than the command

```
PRINT - 3 ↑ 2
```

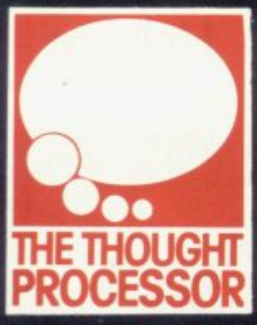
for which the Spectrum prints an answer of -9 which is incorrect — the answer is, of course, + 9.

The reason the routine generates an error message is that the Spectrum treats all numbers as real numbers, i.e., as non-integers, and raising a negative number to a non-integer power is not defined mathematically. The usual interpretation of -3 ↑ 2 is -3 multiplied by itself twice, i.e., -3× -3, but it is difficult to understand how to interpret -3 ↑ 2.5, for example. What does -3 multiplied by itself two-and-a-half times mean?

If the first number is positive, there is a satisfactory interpretation — for a ↑ b read exp (b LNa). That form gives the same result when b is integer as "a multiplied by itself b times" and a result which looks acceptable when b is non-integer. This routine demonstrates the results:

```
10 PRINT ,, "Enter a and b"
20 INPUT a,b
30 PRINT "exp (b*LNa) = "; EXP
  (b*LNa)
40 PRINT "a ↑ b = "; a ↑ b
50 GOTO 10
```

Unfortunately the interpretation does not work if a is negative because the log of a negative number is undefined. The log of zero is minus infinity and so the log of a negative number would have to be less than minus infinity, which is nonsense.



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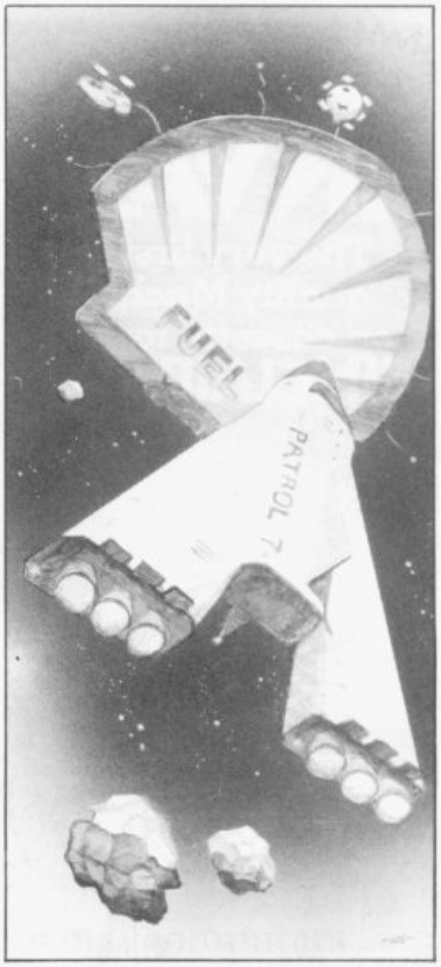
    1 BORDER 2: PAPER 1: INK 6: C
LS
    2 PRINT AT 10,1;"The idea of
the game is to move your starshi
p '▼' left and right going   into
  the    refueling    stations "▩"
  and avoiding the   asteroids
*'   You   may   also   disintegrate
 the asteroids with your laser"
    3 PRINT AT 2,2;"PRESS 5 TO MO
VE LEFT": PRINT AT 4,2;"PRESS 8
TO MOVE RIGHT": PRINT AT 6,2;"PR
ESS 0 TO FIRE LASER": PRINT AT 8
,2;"PRESS RUN TO START": IF INKE
Y$<>"r" THEN GO TO 3
    4 CLS
    5 LET f=50
   20 LET t=5
   30 LET b=13
   35 LET p=1
   40 LET c=20
   42 LET w=BIN 00111100: LET x=B
IN 00011000: LET y=BIN 11111111:
 LET z=BIN 01111110
   43 LET n=1: READ p$:
   44 FOR u=0 TO 7:
   45 READ a: POKE USR p$+u,a
   46 NEXT u
   48 DATA "▼",w,x,x,x,y,z,w,x
   50 INK 7: PRINT AT c,AND#31;"#
": INK 3
   55 LET r=INT (RND#10)+1
   57 IF r=9 THEN PRINT AT 18,AND
#31;"▩"
   75 LET f=f-1
   80 POKE 23692,255
   85 PRINT AT 21,31;"  "
   86 LET p=p+1
   87 PRINT AT 0,13;"SCORE ";p
   90 IF INKEY$="5" AND b>0 THEN
LET b=b-1
  100 IF INKEY$="8" AND b<31 THEN
 LET b=b+1
  108 IF SCREEN$ (t,b)="X" THEN L
ET f=f+25: BEEP .5,40
  109 IF SCREEN$ (t,b)="#" THEN G
O TO 1000
  110 INK 4: PRINT AT t,b;"▼";AT
0,24;"FUEL ";f;" "
  111 IF INKEY$="0" THEN GO TO 20
00
  115 IF p>1000 THEN GO TO 145
  120 PAUSE 10
  145 IF f=0 THEN PRINT AT 0,0;"O
UT OF FUEL": PRINT AT 2,5;"ENTER
 RUN TO PLAY AGAIN": STOP
  149 PRINT OVER 1;AT t,b;"▼": IN
K 3
  150 GO TO 50
  999 STOP
 1000 INK 2: PRINT AT t,b;"▩": IN
K 7: PRINT AT 0,0;"HIT ASTEROID"
: BEEP 2,-10: PRINT AT 2,5;"ENTE
R RUN TO PLAY AGAIN": STOP
 2000 LET f=b#8+3: LET s=(21-t)#8
 2010 INK 7: BRIGHT 1: PLOT f,s:
DRAW OVER 1;0,-50
 2020 PAUSE 5
 2030 PLOT f,s: DRAW OVER 1;0,-50
 2040 LET t=(f-4)/8: FOR w=5 TO 1
2
 2050 BRIGHT 0: IF SCREEN$ (w,t)=
"#" THEN PRINT AT w,t;"▩": BEEP
.2,50: LET p=p+100: PRINT AT w,t
;" ": INK 4
 2060 IF SCREEN$ (w,t)="X" THEN P
RINT AT w,t;" ": BEEP 1,-20
 2070 NEXT w
 2999 GO TO 145
```



STARSHIP

TO MARK the first issue of our special *Spectrum User* section, we decided to include a special program as the first to be published for the new machine.

It is the first we have seen which has solved the problem of how to achieve the SCROLL instruction, needed for the more interesting games. It had its own key on the ZX-81 but on the Spectrum it has to be done by a small routine.

It was developed by N Lock of Faversham, Kent to allow him to adapt the **Galaxy Patrol** program which appeared in our May edition. In the program printed here, called **Starship,** SCROLL is obtained by lines 80 and 85, POKE 23692,255 and PRINT AT 21,31,"(two spaces)".

That allows you to play a good game with the Starship either avoiding or shooting-down asteroids, shown as stars, and calling into the re-fuelling areas, an inverse X. The starship is an inverse arrow on the H key. Sideways movements are controlled by the cursor keys 5 and 8, and 0 is pressed for firing.

The aim is to shoot as many asteroids as possible without running out of fuel.

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Alyson Bailey takes her first steps with personal computers

Learning to program the Spectrum way

HOW CLEVER are computers, I wondered, as I unpacked my first, a Spectrum, two weeks ago. Since then my assessment of this tiny box, no bigger than an average-sized book, has varied through "very bright" to "doesn't think for itself" and "shows great potential".

The manuals which accompanied the new toy were excellent and we soon had a variety of combinations of BORDER and PAPER flashing gaily on and off the TV screen, accompanied by notes of random duration. A clock with a moving hand, graphs and a design produced with circles of different diameters followed in quick succession. If this was computing, it was tremendous fun.

It was the youngest member of the family, aged 14, who noticed the first deficiency. His friends, he said, had computers which played games and ours did not. So far as we knew, no software was available for the Spectrum and if we wanted games we would have to type-in the programs ourselves. Armed with a selection of computer magazines we set to work enthusiastically but our enthusiasm soon began to wane.

The print for some of the programs was too faint to read. Others, though clearly printed, did not work. Our typing errors did not help; the computer was amazingly fussy about punctuation and that had never been one of our strong points.

Although admitting that some of the failures were our fault, others, we were convinced, were not. The computer refused some words like RND(99) and other programs containing words like CHR and PEEK seemed doomed to failure. PLOT resulted in minature graphs in the bottom left-hand corner of the screen.

What was wrong? Did the computer have a language and perhaps even a dialect all of its own which prevented it communicating with even its closest relatives, the ZX-80 and ZX-81? Was this ASCII — whatever ASCII is? At long last we found a program which worked — **Luca** from *Sinclair User,* June, 1982. Junior added sound and colour and altered the graphics and what a difference those additions made. Who complained that the sound was too quiet? Imagine all those beeps played at the same volume as pop music.

Success was followed by more failures, despite avoiding programs containing "foreign" words. Had we over-estimated the powers of understanding of our computer yet again? We studied the listings. Surely there were mistakes. Should the letter in one program not be the number 5, the INT in another be replaced by =; was CLS missing in another?

Several seemed to have whole lines missing while others had superfluous ones, no doubt relics of bygone versions. Our computer could not cope with typing errors. Those errors were human

continued on page xiv

continued from page xiii

and beyond the mental capacity of the Spectrum. With errors corrected, those programs produced several more working games. Why, we asked, do producers of magazines over-estimate the ability of computers? Surely experience should have taught them that computers are not superhuman?

Frustrated by our failures but elated by our ever-improving ability to understand our computer, we decided to try to write our own program. We agreed that the concept of our first attempt must be simple. *Sinclair User* provided the basic idea, the game **Nim.** It is a game for two players who take turns to take any number of matches, up to a pre-determined value, from a pile of 100. The winner is the person who takes the last match. We typed-in the basic game:

```
100 LET j = 100
150 PRINT j
200 INPUT a
300 LET j = 100-a
400 PRINT j
500 GO TO 200
```

and decided to take up to 11 matches and set our program to RUN. It worked. "That is a bit boring", commented junior, and I must admit it fell far short of **Space Invaders.**

"Wait", I said, "it will get better". Colour impressed him, so we added that — line 10 — and moved the numbers to the centre of the screen — edit lines 150 and 400 — remembering to clear one before the next appeared — line 390.

Running the program produced only a marginally better response. We added captions, lines 15, 20, 22 — without "one player and the" — 30, 32, 34, 36; some questions and demands for answers — lines 40, 50, 60, 65, 70, 75 — let the computer decide whose turn was next — ,lines 90, 170, 172, without "AND bs "c"), 210, edit 500 and gave a choice of number to be subtracted — lines 140, 145.

Then the game was much more interesting but cheating began to rear its head and had to be eliminated — lines 240, 250. After much thought, I realised how to win and decided to let the computer take my turn if so requested — add the remainder of lines 22 and 172 and add lines 24, 67, 175, 190. We also added lines 450, 1000, 1010, 1020, 1030 to announce the winner. Interest soared.

It was at that point that the computer showed human characteristics. It refused to play if it knew it could be beaten. Addition of another line — 180 — forced it to continue playing. Then it could not prevent me winning, provided my mathematics did not let me down — and frequently they did. Junior complained that the computer won only because it had second turn. He was given the choice of first or second turn — lines 72, 95 — but still he lost and I won. No-one else has beaten the computer and if they do I will alter the program so that even I cannot win.

All that leads me to wonder who really is my opponent when I play games against a computer. Is the computer as intelligent as it appears or am I playing some far-off programmer I have never met?

Put this program into your computer and see if you can beat it or me. If you can, try to alter the program to make the computer win every time. If you succeed you are the true winner. The computer can achieve no more than the programmer — or can it? Are you as quick at mathematics? I am not.

```
  10 BORDER 1: PAPER 6: CLS : PA
PER 6
  15 PRINT AT 3,13;"NIMD"
  20 PRINT AT 5,5;"This is a gam
e for two"
  22 PRINT "players,or one playe
r and the"
  24 PRINT "computer"
  30 PRINT AT 8,5;"The players t
aketurns to"
  32 PRINT "subtract any number
 <=a"
  34 PRINT "predetermined value
from 100.The"
  36 PRINT "winner is the one to
 reach 0."
  40 PRINT AT 14,0;"What is your
 name?"
  50 INPUT a$
  60 CLS
  65 PRINT "Who are you going to
 play?"
  67 PRINT "(Computer=c)"
  70 INPUT b$
  72 INPUT "Who is going to play
 first?";c$
  75 CLS
  90 LET g=0
  95 IF c$=b$ THEN LET g=g+1
 100 LET j=100
 140 INPUT "Max.no.to be subtrac
ted?";b
 145 PRINT AT 3,3;"Max.=";b
 150 PRINT AT 11,14;j
 170 IF g=0 THEN PRINT AT 19,2;a
$;"s turn": LET g=g+1: GO TO 200
 172 IF g=1 AND b$<>"c" THEN PRI
NT AT 19,2;b$;"s turn": LET g=g-
1: GO TO 200
 175 IF g=1 AND b$="c" THEN LET
c=j-INT (j/(b+1))*(b+1)
 180 IF c=0 THEN LET c=INT (RND*
b+1)
 190 LET a=c: LET g=g-1: PRINT A
T 19,2;"Computers turn=";c: PAUS
E 150: GO TO 210
 200 INPUT a
 210 PRINT AT 19,2;"(30 spaces)"
 240 LET a=INT (a)
 250 IF a=0 OR a>j OR a>b THEN P
RINT AT 19,2;"Try again(20 space
s": GO TO 200
 300 LET j=j-a
 390 PRINT AT 11,14;"(3 spaces)"
 400 PRINT AT 11,15;j
 450 IF j=0 THEN GO TO 1000
 500 GO TO 170
1000 CLS
1010 IF g=1 THEN PRINT AT 11,3;a
$;"is the winner"
1020 IF g=0 AND b$="c" THEN PRIN
T AT 11,3;"The computer is the
winner"
1030 IF g=0 AND b$<>"c" THEN PRI
NT AT 11,3;b$;"is the winner"
```

ZX Spectrum — ZX81

In 1981, ACS Software published ACSEMBLER and DIS-ACSEM. These are now generally regarded as quite simply the best assembler and disassembler programs available for the ZX81.

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