

**HOTTEST
YET IN....**

**STRAPER
CAPEK**

Programmed
by Bill Hogue



POSS

bottom of your panel. The delta velocity (dV) digit indicates the rate in mph at which your velocity is changing (5 to -5) each second. The delta altitude gauge (dA) tells your rate of descent or ascent (-25 to 25) in feet per second. On touchdown, your rate of descent cannot exceed -4 feet per second or your landing gear will collapse. There is also a time gauge (T) to indicate how long you have been at the controls.

After Touchdown

Once you touch down, you must stop the plane before you reach the end of the runway. For the quickest stop, make sure the dV gauge is at the minimum (-5). Your stick has four feather controls. Push it up or down to increase or decrease your rate of descent (altitude). Push the stick left or right to decrease or increase your velocity.

When you successfully land, you'll be given a score to evaluate your flight. This score is based on the time it took you to land the plane; your ability to hold it on the glide path; and the distance to the end of the runway once you've stopped. If the plane is above or below the glide path, points are deducted from your score; so it is possible to accumulate a negative score.

It may take you several flights to become adjusted to the control and instrumentation — but with some practice you'll soon be flying for a high score. Scores in excess of 2500 are exceptional.

Program 1: Nightflyer — Atari Version

```

7 HS=0: DIM B*(35)
8 GRAPHICS 7: SETCOLOR 2,0,0: POKE 752,1
9 DEG : GOSUB 800
50 SH=80: SW=160: RL=4000: RW=60
52 T=2: REM T is dist pilot to scrn
54 FS=66/45: REM ft/sec
90 KI=30: VZ=0.85: DZ=83.3: AZ=5: XV=15:
  YV=30: GX=0: XD=15: YD=60: XA=147: YA=60
100 D=15000+RND(0)*15000
102 A=900+RND(1)*900
103 IF ST=0 THEN D=20000: A=1200
105 TX=D/150
110 POKE 18,0: POKE 19,0: POKE 20,0
130 RC=0: V=200: PR=0: CR=0
140 BD=0: BA=0
150 RL=4000: RW=60
200 SOUND 0,100-RC,8,6: POKE 77,0
201 SOUND 1,250-V/2,2,2
208 IF PR=0 AND D<4000 AND A>1000 THEN B$="Altitude too high for safe landing": GOTO 500
210 IF A>1 AND V<80 THEN B$="Velocity below stall level (80)": GOTO 500
211 IF A<30 AND PR=0 THEN B$="Altitude below minimum (30)": GOTO 500
212 IF D<1 AND PR=0 THEN D=4000: PR=1: SETCOLOR 2,0,4
213 IF D<1 THEN B$="Crashed at the end of runway.": GOTO 500
214 IF PR=1 THEN 300
215 X=INT(D/1000): IF X<4 THEN 218
216 IF X>=KI THEN 400
218 KI=X: GOSUB 920
220 A1=T*A/D*SH: A2=((T*A)/(D+RL))*SH
230 RF=T*RW/D*SW: L1=(SW-RF)/2: R1=L1+RF
240 RR=((T*RW)/(D+RL))*SW: L2=(SW-RR)/2: R2=L2+RR
248 IF D<4000 THEN GOSUB 900: GOTO 400
250 GOSUB 900
260 GOTO 400
300 GOSUB 920
310 A1=80: A2=((T*A)/D)*SH: IF A2<1 THEN A2=1
315 IF A<RF THEN RF=RF+1: IF RF>158 THEN RF=158
316 IF A>RF THEN RF=RF-1: IF RF<RR THEN RF=RR+4
320 L1=(SW-RF)/2: R1=L1+RF
325 RR=((T*RW)/(D))*SW: L2=(SW-RR)/2: R2=L2+RR
330 GOSUB 900
350 IF A>D/10 THEN B$="Altitude too high for safe landing": GOTO 500
400 T1=TI: TI=(PEEK(20)+PEEK(19)*256+PEEK(18)*65536)/60: TD=TI-T1
403 X=STICK(0): IF X=15 THEN 450
404 GOTO X+400
405 VD=VD+1: RC=RC-V/40: GOTO 440
406 VD=VD+1: RC=RC+V/40: GOTO 440
407 VD=VD+1: GOTO 440
409 VD=VD-1: RC=RC-V/40: GOTO 440
410 VD=VD-1: RC=RC+V/40: GOTO 440
411 VD=VD-1: GOTO 440
412 IF X=9 OR X=5 OR X=13 THEN RC=RC-V/40
413 RC=RC+V/40: GOTO 440
414 RC=RC+V/40: GOTO 440
420 X=STICK(1): IF X=10 OR X=14 OR X=6 THEN VD=VD+1: IF VD>5 THEN VD=5
422 IF X=9 OR X=5 OR X=13 THEN VD=VD-1: IF VD<-5 THEN VD=-5
440 IF VD<-5 THEN VD=-5
442 IF VD>5 THEN VD=5
444 IF RC>25 THEN RC=25
446 IF RC<-25 THEN RC=-25
450 IF A=0 THEN 452
451 A=A+RC: IF A>1800 THEN A=1800
452 AD=(D)*0.06: IF PR=1 THEN 460
453 IF ABS(A-AD)<30 THEN GP=0: GOTO 460
454 GP=- (A-AD)/30
455 IF GP>8 THEN GP=8
456 IF GP<-8 THEN GP=-8
459 CR=CR-5
460 DV=FS*V*TD: D=D-DV
470 V=V+VD: IF V>300 THEN V=300
471 IF A<0 THEN A=0: FOR I=1 TO 70: SOUND 0,21,8,14: NEXT I: SETCOLOR 2,13,4
472 IF A>0 THEN 480
473 IF RC<-4 THEN B$="Excessive climb rate (-4) CRASHED": GOTO 500
475 V=V+VD-3: RC=0: IF V<1 THEN 600
480 COLOR 0: PLOT 15,60: DRAWTO XD,YD
481 COLOR 1: I=D/DZ-90: GOSUB 999: PLOT 15,60: DRAWTO X+15,Y+60: XD=X+15: YD=Y+60
482 COLOR 0: PLOT 147,60: DRAWTO XA,YA
483 COLOR 1: I=A/AZ-90: GOSUB 999: PLOT 147,60: DRAWTO X+147,Y+60: XA=X+147: YA=Y+60

```

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484 COLOR 0:PLOT 15,30:DRAWTO XV,YV
485 COLOR 2:I=V/VZ-90:GOSUB 999:PLOT
  15,30:DRAWTO X+15,Y+30:XV=X+15:
  YV=Y+30
487 COLOR 0:PLOT 142,30+GX:DRAWTO 15
  2,30+GX
488 COLOR 1:PLOT 143,6P+30:DRAWTO 15
  1,6P+30:GX=6P
490 POKE 656,2:POKE 657,3:PRINT INT(
  D);" ";
491 POKE 657,33:IF A<100 THEN PRINT
  "☐";" ";
492 PRINT INT(A);" ";
493 POKE 657,13:PRINT INT(VD);" ";
494 POKE 657,25:PRINT INT(RC);" ";
498 POKE 657,19:PRINT INT(TI);
499 GOTO 200
500 SETCOLOR 4,5,4:SETCOLOR 2,5,4
505 POKE 656,0:POKE 657,3:PRINT "
  (34 SPACES)";:SOUND 0,0,0,0
510 POKE 656,0:POKE 657,4:PRINT B#;
550 GOTO 650
600 SETCOLOR 4,11,4:SETCOLOR 2,11,4
602 PT=(TX-TI)*10+D/2+CR+1000
606 IF PT>HS THEN HS=INT(PT):POKE 20
  9,INT(HS/256):POKE 208,HS-INT(HS
  /256)*256
610 POKE 656,0:POKE 657,4
615 PRINT " SCORE ";INT(PT);"
  (3 SPACES)"
650 POKE 656,3:POKE 657,15:PRINT " P
  res s FIRE ";
660 IF STRIG(0)=0 THEN RUN
661 SETCOLOR 0,RND(0)*15,4:FOR I=1 T
  O 50:NEXT I:IF STRIG(0)=0 THEN R
  UN
662 SOUND 0,RND(0)*255,10,2
664 POKE 656,3:POKE 657,15:PRINT " F
  res s Fire";:FOR I=1 TO 50:NEXT
  I:SOUND 0,0,0,0
666 GOTO 650
800 POKE 656,1:POKE 657,2
802 ? "(F){6 M}{G} (F){4 M}{G} (F)
  {3 M}{G} (F){4 M}{G} (F){6 M}
  {G}"
803 ? "(V){6 SPACES}{B} (V)
  {4 SPACES}{B} (V){3 SPACES}{B}
  (V){4 SPACES}{B} (V){6 SPACES}
  {B}"
804 ? "{G}{6 N}{F} (G){4 N}{F} (G)
  {3 N}{F} (G){4 N}{F} (G){6 N}
  {F}";
806 HS=PEEK(209)*256+PEEK(208)
818 POKE 656,0:POKE 657,3:PRINT "Nig
  ht Flyer{9 SPACES}High Score ";H
  S;
820 R=11
822 FOR I=0 TO 360 STEP 5
824 X=R*COS(I):Y=R*SIN(I)*0.9
825 COLOR 2:PLOT X+15,Y+60:PLOT X+14
  7,Y+60
826 COLOR 1:PLOT X+15,Y+30:PLOT X+14
  7,Y+30
828 NEXT I
832 COLOR 1:PLOT 15,30:DRAWTO 26,30
833 COLOR 2:PLOT 15,30:DRAWTO 15,20
834 PLOT 137,30:DRAWTO 140,30:PLOT 1
  54,30:DRAWTO 157,30
836 PLOT 15,60:DRAWTO 15,50:PLOT 147
  ,60:DRAWTO 147,50
860 POKE 656,0:POKE 657,3
862 PRINT "Random <T> or Standard <C>
  > START ?";

```

```

870 IF STICK(0)=14 THEN ST=1:GOTO 88
  0
872 IF STICK(0)=13 THEN ST=0:GOTO 88
  0
874 POKE 705,RND(0)*255:POKE 704,RND
  (0)*255
875 SOUND 0,RND(0)*255,10,2:FOR I=1
  TO 20:NEXT I
876 FOR I=1 TO 100:NEXT I:GOTO 870
880 POKE 656,0:POKE 657,3:PRINT "
  (34 SPACES)";:SOUND 0,0,0,0
881 POKE 656,0:POKE 657,2
882 ? "(3 SPACES)Ds{6 SPACES}dV
  (5 SPACES)T{5 SPACES}dA
  (6 SPACES)A1";
899 RETURN
900 REM
901 IF L1<27 THEN L1=27
902 IF L2<27 THEN L2=27
903 IF L2>135 THEN L2=135
904 IF R2>135 THEN R2=135
905 IF R1<27 THEN R1=27
906 IF R1>135 THEN R1=135
907 IF A1>65 THEN A1=65
908 IF A2>65 THEN A2=65
910 COLOR 1:IF PR=1 THEN 914
912 PLOT L1,A1:DRAWTO R1,A1
914 PLOT L2,A2:DRAWTO R2,A2
915 COLOR 2:PLOT L1,A1:DRAWTO L2,A2:
  PLOT R1,A1:DRAWTO R2,A2
918 RETURN
920 COLOR 0:PLOT L1,A1:DRAWTO R1,A1:
  PLOT L2,A2:DRAWTO R2,A2
922 PLOT L1,A1:DRAWTO L2,A2:PLOT R1,
  A1:DRAWTO R2,A2:RETURN
999 X=10*COS(I):Y=10*SIN(I)*0.9:RETU
  RN

```

Program 2: Nightflyer — Apple Version

Translation by Kevin Martin, Programming Assistant

```

1 HOME : HGR2 : POKE 49233,0: POKE 492
  36,0: FOR I = 1 TO 100: HCOLOR= INT
  ( RND (1) * 8): HPLT 140,80 TO INT
  ( RND (1) * 280), INT ( RND (1) *
  160): NEXT I
2 POKE 799,0: POKE 800,0: FOR I = 770 TO
  795: READ M: POKE I,M: NEXT I
3 DATA 172,1,3,174,1,3,169,4,32,168,2
  52,173,48,192,232,208,253,136,208,
  239,206,0,3,208,231,96
4 CLEAR
5 HOME
7 HS = 0: DIM B*(35)
8 HGR
9 DEG = .017452406: GOSUB 800
50 SH = 160:SW = 280:RL = 4000:RW = 60
52 T = 2: REM T IS DIST PILOT TO SCR N
54 FS = 66 / 45: REM FT/SEC
90 LD = 0:KI = 80:VZ = 0.85:DZ = 100:AZ
  = 5:XV = 30:YV = 80:GX = 0:XD = 3
  0:YD = 120:XA = 250:YA = 120
100 D = 15000 + RND (1) * 15000
102 A = 900 + RND (1) * 900
103 IF ST = 0 THEN D = 20000:A = 1200
105 TX = D / 150
130 RC = 0:V = 200:PR = 0:CR = 0
140 BD = 0:BA = 0
150 RL = 4000:RW = 60
200 REM
208 IF PR = 0 AND D < 4000 AND A > 100
  0 THEN B# = "ALTITUDE TOO HIGH FOR
  SAFE LANDING": GOTO 500

```

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Apple Version Notes For Nightflyer

Kevin Marfin, Editorial Programmer

The Apple version of "Nightflyer" requires either game paddles or a joystick. If you are using paddles, control the plane's altitude (delta altitude or dA) by turning paddle 1. Likewise, control the plane's velocity (delta velocity or dV) by rotating paddle 0. On the other hand, if you use a joystick, follow the directions provided with the Atari version.

Landing the plane successfully takes practice and is quite challenging. Be sure to carefully read the details in the article on landing and scoring. To score the most points, you must touch down safely and stop the plane before you reach the end of the runway. Your overall score is based on the time of flight, your ability to hold the plane on the glide path, and the distance you are from the end of the runway when the plane stops.

The program sets up a crash sequence on the second high-resolution graphics page (line 1). The text and second high-resolution screen are first cleared. Then, using two POKEs, program control is transferred to the blank text screen so that you don't see what is being plotted. Later on, if you crash, the program quickly flips between the two high-resolution pages to simulate the crash (lines 520 - 526).

The sound routines for Nightflyer are POKEd into memory in line 2. The program stores the frequency of the sound in location 769 and its length in location 768. This routine produces the random notes at the beginning and end of each play. It also provides the crash sound (line 515) and the sound that is heard when the plane touches down.

```

210 IF A > 1 AND V < 80 THEN B$ = "VEL
OCITY BELOW STALL LEVEL (80)": GOTO
500
211 IF A < 30 AND PR = 0 THEN B$ = "AL
TITUDE BELOW MINIMUM (30)": GOTO 5
00
212 IF D < 1 AND PR = 0 THEN D = 4000:
PR = 1
213 IF D < 1 THEN B$ = "CRASHED AT THE
END OF RUNWAY.": GOTO 500
214 IF PR = 1 THEN 300
215 X = INT (D / 1000): IF X < 4 THEN
218
216 IF X > = KI THEN 400
218 KI = X: GOSUB 920
220 A1 = T * A / D * SH: A2 = ((T * A) /

```

```

(D + RL)) * SH
230 RF = T * RW / D * SW: L1 = (SW - RF)
/ 2: R1 = L1 + RF
240 RR = ((T * RW) / (D + RL)) * SW: L2 =
(SW - RR) / 2: R2 = L2 + RR
248 IF D < 4000 THEN GOSUB 900: GOTO
400
250 GOSUB 900
260 GOTO 400
300 GOSUB 920
310 A1 = 160: A2 = ((T * A) / D) * SH: IF
A2 < 1 THEN A2 = 1
315 IF A < RF THEN RF = RF + 1: IF RF >
278 THEN RF = 278
316 IF A > RF THEN RF = RF - 1: IF RF <
RR THEN RF = RR + 7
320 L1 = (SW - RF) / 2: R1 = L1 + RF
325 RR = ((T * RW) / (D)) * SW: L2 = (SW
- RR) / 2: R2 = L2 + RR
330 GOSUB 900
350 IF A > D / 10 THEN B$ = "ALTITUDE
TOO HIGH FOR SAFE LANDING": GOTO 5
00
400 T1 = TI: TI = TI + 1: TD = TI - T1
403 X = PDL (0): Y = PDL (1): IF Y > 5
0 AND Y < 200 AND X > 50 AND X < 2
00 THEN 450
405 IF X > 200 AND Y > 200 THEN VD = V
D + 1: RC = RC - V / 40: GOTO 440
406 IF X > 200 AND Y < 50 THEN VD = VD
+ 1: RC = RC + V / 40: GOTO 440
407 IF X > 200 AND Y > 50 AND Y < 200 THEN
VD = VD + 1: GOTO 440
409 IF X < 50 AND Y > 200 THEN VD = VD
- 1: RC = RC - V / 40: GOTO 440
410 IF X < 50 AND Y < 50 THEN VD = VD -
1: RC = RC + V / 40: GOTO 440
411 IF X < 50 AND Y > 50 AND Y < 200 THEN
VD = VD - 1: GOTO 440
413 IF X > 50 AND X < 200 AND Y > 200 THEN
RC = RC - V / 40: GOTO 440
414 IF X > 50 AND X < 200 AND Y < 50 THEN
RC = RC + V / 40: GOTO 440
440 IF VD < - 5 THEN VD = - 5
442 IF VD > 5 THEN VD = 5
444 IF RC > 25 THEN RC = 25
446 IF RC < - 25 THEN RC = - 25
450 IF A = 0 THEN 452
451 A = A + RC: IF A > 1800 THEN A = 18
00
452 AD = (D) * 0.06: IF PR = 1 THEN 460
453 IF ABS (A - AD) < 30 THEN GP = 0:
GOTO 460
454 GP = - (A - AD) / 30
455 IF GP > 12 THEN GP = 12
456 IF GP < - 12 THEN GP = - 12
459 CR = CR - 5
460 DV = FS * V * TD: D = D - DV
470 V = V + VD: IF V > 300 THEN V = 300
471 IF A < 0 THEN A = 0
472 IF A > 0 THEN 480
473 IF RC < - 4 THEN B$ = "EXCESSIVE
CLIMB RATE (-4) CRASHED": GOTO 500
475 V = V + VD - 3: RC = 0: IF V < 1 THEN
600
476 IF LD = 0 THEN LD = 1: FOR I = 1 TO
10: POKE 768, I: POKE 769, I: CALL 7
70: NEXT
480 HCOLOR = 0: HPLLOT 30, 120 TO XD, YD
481 HCOLOR = 3: I = D / DZ - 90: GOSUB 9

```

```

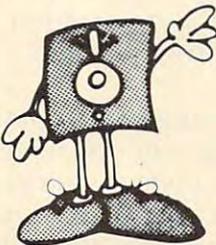
99: H PLOT 30,120 TO X + 30,Y + 120
:XD = X + 30:YD = Y + 120
482 HCOLOR= 0: H PLOT 250,120 TO XA,YA
483 HCOLOR= 3:I = A / AZ - 90: GOSUB 9
99: H PLOT 250,120 TO X + 250,Y + 1
20:XA = X + 250:YA = Y + 120
484 HCOLOR= 0: H PLOT 30,80 TO XV,YV
485 HCOLOR= 3:I = V / VZ - 90: GOSUB 9
99: H PLOT 30,80 TO X + 30,Y + 80:X
V = X + 30:YV = Y + 80
487 HCOLOR= 0: H PLOT 241,80 + GX TO 25
9,80 + GX
488 HCOLOR= 3: H PLOT 241,GP + 80 TO 25
9,GP + 80:GX = GP
490 V TAB 23: H TAB 5: PRINT INT (D);"
";
491 H TAB 31: IF A < 100 THEN INVERSE
: PRINT "*";: NORMAL : PRINT " ";
492 PRINT INT (A);" ";
493 H TAB 15: PRINT INT (VD);" ";
494 H TAB 24: PRINT INT (RC);" ";
498 H TAB 19: PRINT INT (TI);
499 GOTO 200
500 REM
505 V TAB 21: H TAB 3: PRINT "
"
510 V TAB 21: H TAB 4: PRINT B*;
515 FOR I = 1 TO 10: POKE 768,1: POKE
769,10: CALL 770: NEXT
520 FOR I = 1 TO 50
525 POKE 49234,0: POKE 49237,0: POKE 4
9236,0: POKE 49235,0
526 NEXT I
550 GOTO 650
600 REM
602 PT = (TX - TI) * 10 + D / 2 + CR +
1000
606 IF PT > HS THEN HS = INT (PT): POKE
800, INT (HS / 256): POKE 799,HS -
INT (HS / 256) * 256
610 V TAB 21: H TAB 4
615 PRINT "SCORE "; INT (PT);" "
650 V TAB 24: H TAB 13: PRINT "PRESS BUT
TON 0";
655 POKE 769, RND (1) * 254 + 1: POKE
768,3: CALL 770
660 IF PEEK (- 16287) > 127 THEN 4
661 FOR I = 1 TO 250: NEXT I: IF PEEK
(- 16287) > 127 THEN 4
662 POKE 769, RND (1) * 254 + 1: POKE
768,3: CALL 770
664 H TAB 13: INVERSE : PRINT "PRESS BU
TTON 0";: NORMAL : FOR I = 1 TO 25
0: NEXT I
666 GOTO 650
800 V TAB 22: H TAB 4
802 PRINT "/-----"; CHR$ (92);"/-----"
; CHR$ (92);"/-----"; CHR$ (92);"/--
---"; CHR$ (92);"/-----"; CHR$ (92
)
803 H TAB 4: PRINT "!! !! !!
!! !! !!"
804 H TAB 4: PRINT CHR$ (92);"-----/"
; CHR$ (92);"-----/"; CHR$ (92);"---
-/" ; CHR$ (92);"-----/"; CHR$ (92);
"-----/" ;
806 HS = PEEK (800) * 256 + PEEK (799
)
818 V TAB 21: H TAB 4: PRINT "NIGHT FLYE
R HIGH SCORE ";HS;
820 R = 19
822 FOR I = 0 TO 360 STEP 3
824 X = R * COS (I * DEG):Y = R * SIN
(I * DEG) * .9

```

```

825 HCOLOR= 3: H PLOT X + 30,Y + 120: H PLOT
X + 250,Y + 120
826 HCOLOR= 3: H PLOT X + 30,Y + 80: H PLOT
X + 250,Y + 80
828 NEXT I
832 HCOLOR= 3: H PLOT 30,80 TO 47,80
833 HCOLOR= 3: H PLOT 30,80 TO 30,63
834 H PLOT 232,80 TO 240,80: H PLOT 260,
80 TO 268,80
836 H PLOT 30,120 TO 30,102: H PLOT 250,
120 TO 250,102
860 V TAB 21: H TAB 3
862 PRINT "RANDOM <";: INVERSE : PRINT
"U";: NORMAL : PRINT "> OR STANDAR
D <";: INVERSE : PRINT "D";: NORMAL
: PRINT "> START ? ";
870 IF PDL (1) < 50 THEN ST = 1: GOTO
880
872 IF PDL (1) > 210 THEN ST = 0: GOTO
880
875 POKE 769, RND (1) * 254 + 1: POKE
768,3: CALL 770
876 GOTO 870
880 V TAB 21: H TAB 3: PRINT "
";
881 V TAB 21: H TAB 4
882 PRINT " DS DV T DA
AL";
899 RETURN
900 REM
901 IF L1 < 50 THEN L1 = 50
902 IF L2 < 50 THEN L2 = 50
903 IF L2 > 230 THEN L2 = 230
904 IF R2 > 230 THEN R2 = 230
905 IF R1 < 50 THEN R1 = 50
906 IF R1 > 230 THEN R1 = 230
907 IF A1 > 160 THEN A1 = 160
908 IF A2 > 160 THEN A2 = 160
910 HCOLOR= 3: IF PR = 1 THEN 914
912 H PLOT L1,A1 TO R1,A1
914 H PLOT L2,A2 TO R2,A2
915 HCOLOR= 3: H PLOT L1,A1 TO L2,A2: H PLOT
R1,A1 TO R2,A2
918 RETURN
920 HCOLOR= 0: H PLOT L1,A1 TO R1,A1: H PLOT
L2,A2 TO R2,A2
922 H PLOT L1,A1 TO L2,A2: H PLOT R1,A1 TO
R2,A2: RETURN
999 X = 17 * COS (I * DEG):Y = 17 * SIN
(I * DEG) * .9: RETURN ©

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Space Thief

Steve Low

The survival of two neighboring space civilizations depends on their ability to smuggle power pods, but they must cross through the megabarrier. This two-player game involves both an offensive and defensive strategy. Written for the Atari, a 64 version is included. Two joysticks are required.

For eons the Alpha and Zeta civilizations have coexisted with a mutual trade agreement. Each uses an energy station dependent upon a combination of power pods from both sides. An undeclared war has negated this treaty.

To maintain your energy base, pods must be smuggled from the adjoining nation and deposited at your station for processing. Load the pods by docking your cargo ship next to them and pressing the joystick trigger. The pods can be destroyed when the ship carrying them either strikes the megabarrier or is shot by an enemy ship. Your cargo ships are unharmed by shots from a laser cannon. Pass pods through the correct power plant to unload.

As starship commander, you must also defend your native pods from capture. For this defensive necessity, your cargo ship has been equipped with a unidirectional laser cannon.

Making transportation difficult is the megabarrier, a barricade which constantly relocates but always leaves an area open. You may pass through the opening without interference; however, crashing into the barrier returns your ship to its starting location.

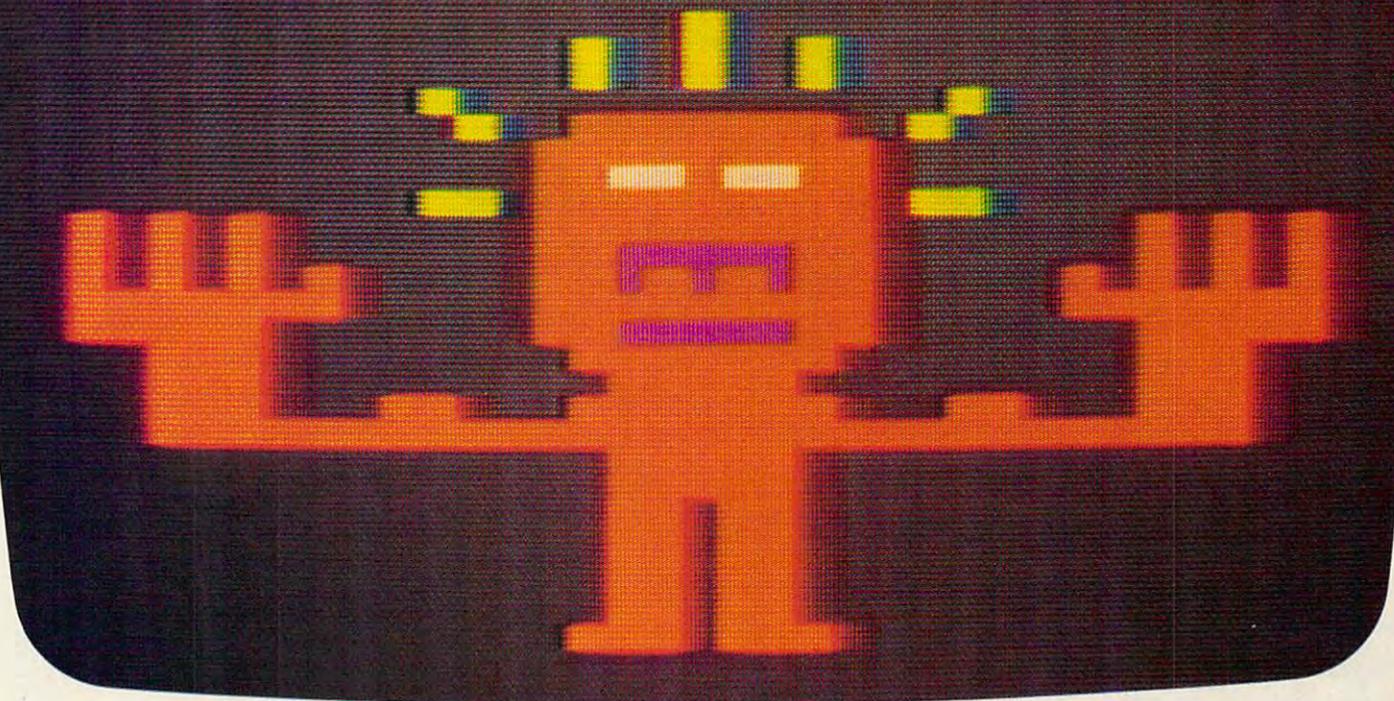
The game is won by accruing points. You receive two points for blasting your opponent and five points for depositing pods at your power station. The game terminates when the last pod from either civilization is deposited safely or lost. Replay is initialized by pressing START.



Player 1 has captured the opponent's pod in "Space Thief." Atari version.

Program 1: Space Thief — Atari Version

```
150 DIM UD(15),RL(15)
160 GRAPHICS 17:SETCOLOR 0,2,10:SETC
OLOR 4,8,3
170 POSITION 4,7:? #6;"SPACE THIEF"
200 FOR DEL=1 TO 750:NEXT DEL
210 GRAPHICS 17:SCREEN=PEEK(88)+256*
PEEK(89)
220 SETCOLOR 0,2,10:SETCOLOR 1,3,8:SE
TCOLOR 2,12,6:SETCOLOR 3,3,4:SE
TCOLOR 4,8,3
230 REM Check for initialization
240 CHSET=(PEEK(106)-8)*256
250 IF PEEK(CHSET+10)=24 THEN POKE 5
59,0:GOTO 300
260 POKE 559,34:POSITION 6,10:? #6;"
PLEASE":POSITION 7,13:? #6;"WAIT
"
270 FOR DEL=1 TO 750:NEXT DEL
280 POSITION 6,10:? #6;"{6 SPACES}":
POSITION 7,13:? #6;"{4 SPACES}"
290 POKE 559,0:GOSUB 1600
300 POKE 756,PEEK(106)-8
```



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24K \$29.95



TIMBER!

TIMBER! is an action-packed arcade style game with multiple levels of play and difficulty. You're Blackjack Daniels, the greatest lumberjack that ever set foot into an ATARI computer! Imagine yourself in the deep dark forest chopping down trees for the Upland Logging Corporation. Your boss has sent you on a very important mission and your job depends on the successful completion of that mission. You are to clear the forest, chopping down trees into cords so that the logging trucks may easily transport them to the mill.

But things aren't as rosy as you thought they might be. You've noticed several forest creatures looking at you as you're trying to meet your logging deadline. Some of them are downright unfriendly looking! You quickly realize that you will be short of your quota of trees in this area, and you'll need to move on to a new woodland area to get enough trees downed. But, everywhere you turn, you see snakes, bears, and other forest creatures. To top everything off, your ax is getting dull and you're finding out that you must hit the "sweet" part of the tree to make it fall. Time is running out! You must race on to meet the deadline. You quickly enter a mole hole as a snake is about to strike and find out that it comes out in another part of the forest. In fact, there are mole holes all around you and by jumping into them, you find shortcuts to other parts of the forest.

You can't swim and the river is flowing rapidly. You know that your only way to get to the trees on the other side of the river is to cross the bridge. You look around. Oh! Here comes a bear. You quickly cross the bridge and you're temporarily saved from the bear.

By the way, I'm the boss now and I need someone to perform an emergency mission for me. Will you be brave enough to try it? TIMBER! is all machine language. Requires 40K RAM, a disk drive and 1 joystick. Disk only for ATARI.

40 K \$29.95

THE ABRAXAS ADVENTURE SERIES No. 1:



Assault On The Astral Rift

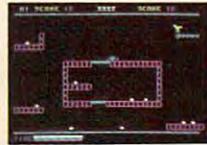
First Program of the New ABRAXAS Series

Adventure enthusiasts, take heart! The ultimate adventure series has arrived, from MMG Micro Software. ASSAULT ON THE ASTRAL RIFT is the first in the new ABRAXAS Adventure series and you'll not soon tire of its many challenges. It's a multiplayer adventure, also playable by a single player, with graphics and music unlike any seen or heard before. Imagine, really being able to read minds, to think in totally foreign languages, and to work together toward the ultimate goal of saving our universe. Imagine an adventure game different with each play. Isn't this why you bought your computer? You are a member of a small, select band of people with a crucial secret, charged with the responsibility of maintaining the universe as we know it. One of your group has discovered the existence of alternate universes, populated by creatures known on Earth only by our legends. Far worse was the discovery that some of them have learned to travel between the many universes, and, in doing so, have weakened the fabric of our universe. They must be stopped, and you and your comrades are the only ones who can do it!

Your quest begins in a huge stone castle recently converted to a hotel. The guests left abruptly when strange occurrences began, but you know the real nature of these strange events. Time is crucial, and you'll have to begin your journey now. The time holes have begun to open, the first sign of the weakening of the fabric of our universe!

This first program in the ABRAXAS Adventure Series, ASSAULT ON THE ASTRAL RIFT, requires 48K and 1 disk drive. Available on disk only for ATARI.

48K \$39.95



Phoenix Lair

NEW!

PHOENIX LAIR is an arcade style game comprised of 10 boards and 10 speed levels. It is unlike any game on the market today. Multiple strategies, an interlude jousting challenge between boards, bright and lively colors and music add to the already superb play of this completely unique and different game. Game

Play: The game begins at board one and advances to higher boards after successful completion. Many obstacles are encountered on the various boards as points are accumulated. At the beginning of each board, the Phoenix must leave its lair in search of enemy eggs. The Phoenix flight is controlled in height by the joystick button, and in direction by the joystick itself. After successfully destroying at least six of these eggs the Phoenix must return to the far right side of its lair. Points are awarded based on the total number of eggs destroyed and the time in which it took to complete the mission. A fast mission will result in additional bonus points. You begin with 5 lives and gain additional lives at boards 7, 9 and 10. PHOENIX LAIR is all machine language. Requires 40K RAM, a disk drive and 1 joystick. Disk only available for COMMODORE and ATARI.

40K \$29.95



Rat Race

NEW!

RAT RACE is an action packed arcade-style game with multiple levels of difficulty and challenge. Colorful graphics and superb music enhance the excitement of the game.

Picture yourself in a fast food restaurant. The restaurant is so busy that as soon as food is prepared, the chef just throws it wherever he has room. The restaurant is obviously very messy and in much confusion! Your job is to gather the food for the orders and place it into the proper bin on top of the screen. The french fries go into the french fry bin, the hamburgers into their own bin, and so on.

Sounds simple, doesn't it? Just gather the food and put it into the appropriate bin. But you know better than that, don't you? There are a few minor problems. Since the food is all over the place, some of the local rats have found the restaurant a very attractive place to hang out for lunch, since it is always so sloppy! Generally, they restrict their activities to certain areas of the screen, but they're so fast, it's a race for your life. If they bite you, you'll begin again with one fewer life. The excitement mounts as the degree of difficulty builds. After you've cleared a few boards, you'll see the infamous super rat, who races anywhere with only one thing in mind—to get you! RAT RACE is all machine language. Requires 40K RAM, 1 disk drive and 1 joystick. Disk only for ATARI.

40K \$29.95

Programs That Teach from MMG



Asteroid Miners

ASTEROID MINERS—A UNIQUE GAME TUTORIAL—is truly that. A 32K game written in BASIC with numerous machine language subroutines, it has 3 levels of difficulty. At the easiest level, it's a race against time; at the hardest, strategy and speed are both critical. Can you beat the high score before time runs out? Get the valuable asteroids, but avoid the duds. Above all, BE CAREFUL! One mistake, and well...ASTEROID MINERS comes with a 50-page book which completely explains every line of the program. The source codes for the BASIC and assembly language programs are included, and fully explained. See how these advanced functions are implemented in a working game! You'll learn machine language routines to relocate the character set, zero the player-missile graphics area of memory, move players, and to put a countdown timer on the screen. Use these routines in your own programs! Every aspect of the program is described in detail, from redefining character sets, to creating multicolored and multifunctional players, to multiprocessing using the vertical blank interrupt. Music, extensive sound and color graphics—in short, a complete tutorial on the advanced functions YOU can use with your ATARI! Disk or tape for ATARI only.

32K \$34.95



MMG CAREER COUNSELOR

A unique and fascinating way to explore the important world of careers. Take the first steps toward discovering the careers that are right for you. It is designed to be used at home, in schools, or in libraries by a wide variety of people. The "Career Search" technique used in the program provides a combination of education, fun, and a sense of adventure, making it as valuable for adults as it is for students.

You enter your likes and dislikes concerning interests, abilities, nature of work and other goals through a set of easy to use menus and displays. The program will generate a list of careers which satisfies your preferences. Through repeated use of the "Career Search" process you gain valuable, life-long insights into your career goals and the hundreds of careers stored by the program.

The program also features a "Career Dictionary," which is another source of clear, concise information. This feature allows you to quickly and easily obtain descriptions of all the desired careers. Disk only available for ATARI.

32K \$59.95 - Expanded APPLE version available on disk only requires 48K \$129.95

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```

310 XPL1=1:XPL2=18:YPL1=11:YPL2=YPL1
320 BUMP1=YSCR+4:BUMP2=YSCR+4:B=0
330 TRS1=0:TRS2=0:PU1=0:PU2=0:SC1=0:
SC2=0
340 REM The power pods @ screens edg
e
350 FOR TRX=0 TO 19 STEP 19:FOR TRY=
2 TO 22:POSITION TRX,TRY:? #6;"E
":NEXT TRY:NEXT TRX
360 GOSUB 1460
370 POSITION 4,0:? #6;"SPACE THIEF"
380 POSITION 2,0:? #6;"J":POSITION 1
6,0:? #6;"K":POSITION 3,23:? #6;
"w":POSITION 16,23:? #6;"w"
390 IF B=0 THEN GOSUB 990:B=1:POKE 1
9,0:POKE 559,34
400 REM BEGIN MAIN BODY OF PROGRAM
410 REM Check for # of power pods pi
cked up & therefore {RIGHT} end
of game
420 IF PU1=21 OR PU2=21 THEN GOSUB 1
480
430 REM ? Time to move mega-barrier
440 IF PEEK(19)>=2 THEN FOR ERS=2 TO
23:POKE SCREEN+XSCR+20*ERS,0:NE
XT ERS:GOSUB 990:POKE 19,0
450 ST0=STICK(0):ST1=STICK(1)
460 POKE SCREEN+463,119:POKE SCREEN+
476,119:REM The Power stations
470 IF ST0<>15 THEN POKE SCREEN+XPL1
+20*YPL1,0:IF TRS1=241 THEN POKE
SCREEN+XPL1+20*(YPL1+1),0
480 IF ST0<>15 OR ST1<>15 THEN POKE
53760,30:POKE 53761,164:POKE 77,
0:REM Moving sound & disable 'at
tract mode'
490 XPL1=XPL1+RL(ST0):YPL1=YPL1+UD(S
T0)
500 REM Keep it in the borders
510 IF XPL1>17 THEN XPL1=18
520 IF XPL1<2 THEN XPL1=1
530 IF YPL1<3 THEN YPL1=2
540 IF YPL1>21 THEN YPL1=22
550 REM POKE player 1 to screen
560 POKE SCREEN+XPL1+20*YPL1,42:IF T
RS1=241 THEN POKE SCREEN+XPL1+20
*(YPL1+1),241
570 REM Check for mega-barrier colli
sion
580 IF XPL1<>XSCR THEN 600
590 IF YPL1<=YSCR OR YPL1>=BUMP1 THE
N ZAP=0:HIT=6:GOSUB 1090:IF TRS1
=241 THEN PU1=PU1+1:TRS1=0
600 IF TRS1=241 THEN 660
610 REM Enable power pod pick-up
620 IF XPL1=18 AND STRIG(0)=0 THEN T
RS1=PEEK(SCREEN+19+20*YPL1):IF T
RS1=241 THEN BUMP1=YSCR+3:GOTO 6
40
630 GOTO 660
640 POKE SCREEN+19+20*YPL1,0
650 REM Dropping off pow. pod
660 IF XPL1=3 AND YPL1=22 THEN POKE
53761,0:GOTO 680
670 GOTO 720
680 IF TRS1=241 THEN SC1=SC1+5:GOSUB
1460:FOR W=14 TO 0 STEP -2:SOUN
D 0,W+10,10,W:NEXT W:GOTO 700
690 GOTO 710
700 TRS1=0:PU1=PU1+1
710 REM **Player 1 moved first,now P
1.2 will get to shoot first **
720 IF STRIG(1)=0 AND XPL2<>1 THEN M
X=XPL2-1:MY=YPL2:GOSUB 1330
730 POKE 53761,0
740 REM And now for player 2 to move
750 IF ST1<>15 THEN POKE SCREEN+XPL2
+20*YPL2,0:IF TRS2=241 THEN POKE
SCREEN+XPL2+20*(YPL2+1),0
760 XPL2=XPL2+RL(ST1):YPL2=YPL2+UD(S
T1)
770 IF XPL2>17 THEN XPL2=18
780 IF XPL2<2 THEN XPL2=1
790 IF YPL2<3 THEN YPL2=2
800 IF YPL2>21 THEN YPL2=22
810 POKE SCREEN+XPL2+20*YPL2,43:IF T
RS2=241 THEN POKE SCREEN+XPL2+20
*(YPL2+1),241
820 IF XPL2<>XSCR THEN 840
830 IF YPL2<=YSCR OR YPL2>=BUMP2 THE
N ZAP=1:HIT=6:GOSUB 1090:IF TRS2
=241 THEN PU2=PU2+1:TRS2=0
840 IF TRS2=241 THEN 880
850 IF XPL2=1 AND STRIG(1)=0 THEN TR
S2=PEEK(SCREEN+20*YPL2):IF TRS2=
241 THEN BUMP2=YSCR+3:GOTO 870
860 GOTO 880
870 POKE SCREEN+20*YPL2,0
880 IF XPL2=16 AND YPL2=22 THEN 900
890 GOTO 930
900 IF TRS2=241 THEN SC2=SC2+5:GOSUB
1460:FOR W=14 TO 0 STEP -2:SOUN
D 0,W+10,10,W:NEXT W:GOTO 920
910 GOTO 930
920 TRS2=0:PU2=PU2+1
930 IF STRIG(0)=0 AND XPL1<>18 THEN
MX=XPL1+1:MY=YPL1:GOSUB 1200
940 GOTO 420
950 REM END MAIN BODY OF PROGRAM
960 REM
970 REM SUBROUTINES
980 REM The Mega-barrier & window
990 XSCR=INT(RND(0)*16+2):YSCR=INT(R
ND(0)*16+2)
1000 IF XSCR=XPL1 OR XSCR=XPL2 THEN
990
1010 FOR A1=2 TO YSCR:POKE SCREEN+XS
CR+20*A1,172:NEXT A1
1020 FOR A2=YSCR+4 TO 21:POKE SCREEN
+XSCR+20*A2,172:NEXT A2
1030 BUMP1=YSCR+4:BUMP2=YSCR+4
1040 IF TRS1=241 THEN BUMP1=BUMP1-1
1050 IF TRS2=241 THEN BUMP2=BUMP2-1
1060 RETURN
1070 REM Explosion sound
1080 REM Notice HIT makes sound diff
erent for collisions with wall
vs. being shot
1090 DUR=6:PITCH=20
1100 SOUND 2,75,HIT,15:ICR=0.79+DUR/
100
1110 V1=15:V2=15:V3=15
1120 SOUND 0,PITCH,HIT,V1:SOUND 2,PI
TCH+20,HIT,V2:SOUND 3,PITCH+50,
HIT,V3
1130 V1=V1*ICR:V2=V2*(ICR+0.05):V3=V
3*(ICR+0.08)
1140 IF V3>4 THEN 1120
1150 FOR S=0 TO 3:SOUND S,0,0,0:NEXT
S:IF HIT=6 THEN POKE 19,2
1160 IF HIT=8 THEN RETURN
1170 IF ZAP=0 THEN XPL1=1:YPL1=10:RE
TURN
1180 IF ZAP=1 THEN XPL2=18:YPL2=10:R

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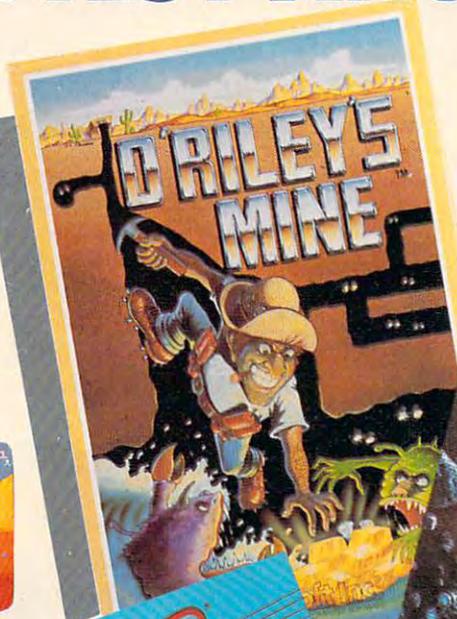
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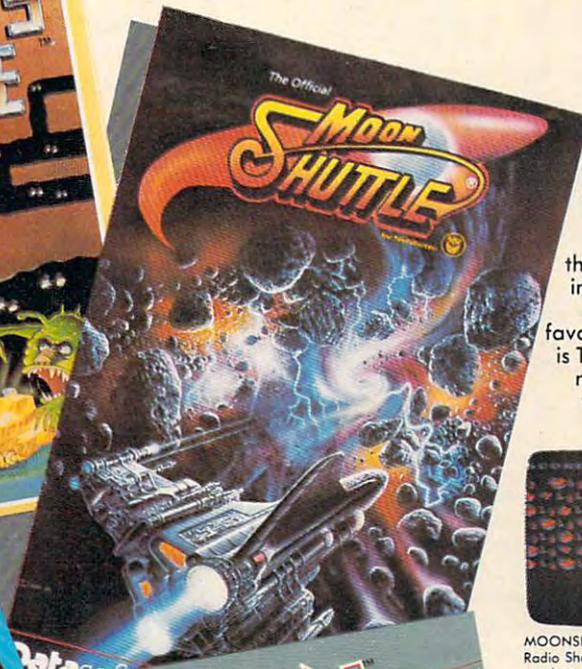


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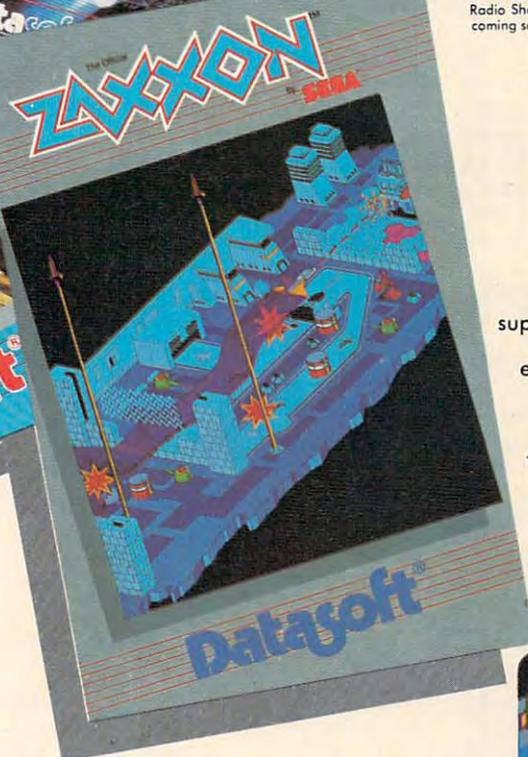
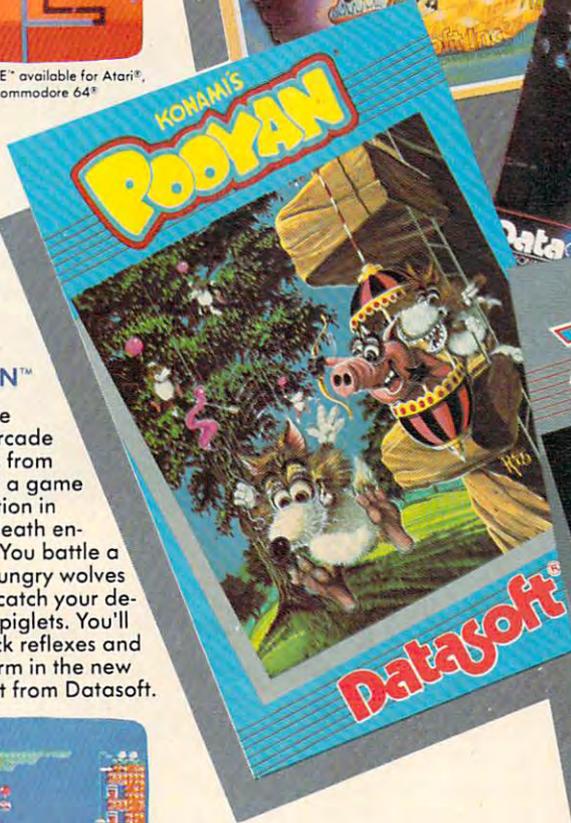


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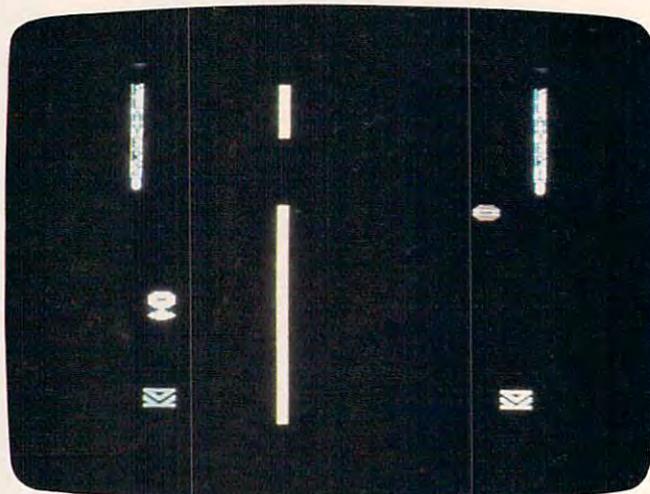
    RETURN
1190 REM Shooting subr pl 1
1200 POKE 53761,0:IF MX=19 THEN RETURN
1210 H=PEEK(SCREEN+MX+20*MY):IF H=17
    2 THEN RETURN
1220 IF H=43 THEN POKE SCREEN+MX+20*
    MY,0:HIT=8:GOTO 1260
1230 POKE SCREEN+MX+20*MY,46:H=PEEK(
    SCREEN+(MX+1)+20*MY):IF H=44 TH
    EN POKE SCREEN+MX+20*MY,0:RETUR
    N
1240 IF H=43 THEN POKE SCREEN+(MX+1)
    +20*MY,0:HIT=8:GOTO 1260
1250 GOTO 1290
1260 POKE SCREEN+MX+20*MY,0:SC1=SC1+
    2:GOSUB 1460:IF TRS2=241 THEN P
    OKE SCREEN+XPL2+20*(MY+1),0:TRS
    2=0:PU2=PU2+1
1270 XPL2=18:YPL2=11:GOSUB 1090
1280 RETURN
1290 POKE SCREEN+MX+20*MY,0:MX=MX+1:
    IF MX=19 THEN RETURN
1300 GOTO 1200
1310 RETURN
1320 REM Shooting subr for pl 2
1330 POKE 53761,0:IF MX=0 THEN RETUR
    N
1340 H=PEEK(SCREEN+MX+20*MY):IF H=17
    2 THEN RETURN
1350 IF H=42 THEN POKE SCREEN+MX+20*
    MY,0:HIT=8:GOTO 1390
1360 POKE SCREEN+MX+20*MY,46:H=PEEK(
    SCREEN+(MX-1)+20*MY):IF H=3 THE
    N POKE SCREEN+MX+20*MY,0:RETURN
1370 IF H=42 THEN POKE SCREEN+(MX-1)
    +20*MY,0:HIT=8:GOTO 1390
1380 GOTO 1420
1390 POKE SCREEN+MX+20*MY,0:SC2=SC2+
    2:GOSUB 1460:IF TRS1=241 THEN P
    OKE SCREEN+XPL1+20*(MY+1),0:TRS
    1=0:PU1=PU1+1
1400 XPL1=1:YPL1=11:GOSUB 1090
1410 RETURN
1420 POKE SCREEN+MX+20*MY,0:MX=MX-1:
    IF MX=0 THEN RETURN
1430 GOTO 1330
1440 RETURN
1450 REM Score printer
1460 POSITION 5,1: ? #6:SC1:POSITION
    12,1: ? #6:SC2:RETURN
1470 REM TO 'Replay' push "START"
1480 FOR I=0 TO 20:C=INT(256*RND(0))
1490 POKE 712,C:FOR DEL=1 TO 25:NEXT
    DEL:POKE 53760,C:POKE 53761,16
    8:NEXT I
1500 POKE 712,131:REM Restore to Set
    color 4,8,3
1510 POSITION 5,7: ? #6:"GAME OVER"
1520 IF SC1>HSC THEN HSC=SC1
1530 IF SC2>HSC THEN HSC=SC2
1540 POSITION 2,12: ? #6:"HIGH SCORE
    - ";HSC
1550 FOR DEL=1 TO 100:NEXT DEL:POKE
    53761,0
1560 IF PEEK(53279)<>6 THEN 1560
1570 GOTO 160
1580 REM INITIALIZATION
1590 REM Internal char set to ROM
1600 FOR I=0 TO 1023:POKE CHSET+I,PE
    EK(57344+I):SOUND 0,PEEK(CHSET+

```

```

    I),10,8:NEXT I
1610 REM Custom character formation
1620 FOR NUM=0 TO 5:READ LOC
1630 FOR I=0 TO 7:READ BN:SOUND 0,BN
    ,10,8
1640 POKE CHSET+(LOC*8)+I,BN
1650 NEXT I:NEXT NUM:SOUND 0,0,0,0
1660 DATA 55,24,24,24,24,60,126,255,
    255
1670 DATA 42,90,60,126,213,171,126,6
    0,90
1680 DATA 43,7,12,28,254,254,28,12,7
1690 DATA 44,24,0,24,0,0,24,0,24
1700 DATA 46,0,0,0,16,56,16,0,0
1710 DATA 49,0,0,0,36,60,0,0,0
1720 REM ** RL & UD Are for joystick
    routine
1730 UD(5)=1:UD(6)=-1:UD(7)=0:UD(9)=
    1:UD(10)=-1:UD(11)=0:UD(13)=1:U
    D(14)=-1:UD(15)=0
1740 RL(5)=1:RL(6)=1:RL(7)=1:RL(9)=-
    1:RL(10)=-1:RL(11)=-1:RL(13)=0:
    RL(14)=0:RL(15)=0
1750 RETURN

```



"Space Thief." 64 version.

Program 2: Space Thief — 64 Version

Translation by Gregg Peele, Assistant Programming Supervisor

```

40 GOSUB60000:GOSUB15851:GOSUB49131:POKE5
    3248+16,(PEEK(53248+16)AND254)
45 GOSUB51179
50 RESTORE:SYS49152:PRINT"{CLR}";:POKE532
    81,0:POKE53280,0:POKE53272,28:GOSUB900
100 H=842:Y=845:C=843:P=850:POKE836,2
200 R=(RND(0)*20)+10:POKEH,R:U=(RND(0)*15
    )+4:POKEY,U:POKEP,160:SYS50530:
300 FORT=1TO60:POKE1304,PEEK(862)+48:POKE
    1304+54272,1:POKE1343+54272,1
310 POKE1343,PEEK(860)+48
320 IFPEEK(860)>=3ORPEEK(862)>=3THENT=60:
    NEXT:GOTO2000
350 NEXT:POKEP,32:SYS50530:GOTO200
900 FORT=1024 TO 1264STEP40:READY:POKET+5
    4272,1:POKET,Y:NEXT
910 FORT=1063 TO 1303STEP40:READY:POKET+5
    4272,1:POKET,Y:NEXT:RETURN
1000 DATA 144,140,129,153,133,146,178
1100 DATA 144,140,129,153,133,146,177

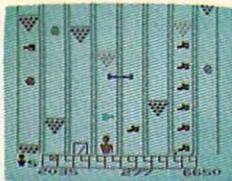
```



DON'T LAUGH. FIVE MINUTES OF ALLEY-OOPS AND YOU WON'T BE ABLE TO TAKE YOUR EYES OFF IT.

Oh sure—it might look silly now. But wait'll it's hurtling toward you, threatening to destroy your perfect game. You'll take it seriously then.

And bowling shoes won't be your only worry. You'll also have to watch for diabolical beer bottles, evil pin sweeps and vicious gum spots.



Sound strange?

Sure. But battling such weird objects is exactly what makes Alley-Oops so original. And so incredibly fun to play.

Alley-Oops is real arcade stuff. In fact, it's a challenge just to get to the next level of play. And there are 8 levels, the last one being the nearly impossible Challenge Round.

There are all kinds of ways to play Alley-Oops—try to mount up points, score a perfect game or reach that highest level. Whichever way you choose, you'll have endless fun playing Alley-Oops.

Just remember—don't take the bowling shoes lightly. After years of being kicked around bowling alleys, they're out to get even.



To survive Alley-Oops, you'll have to contend with diabolical beer bottles, evil pin sets, and vicious gum spots.

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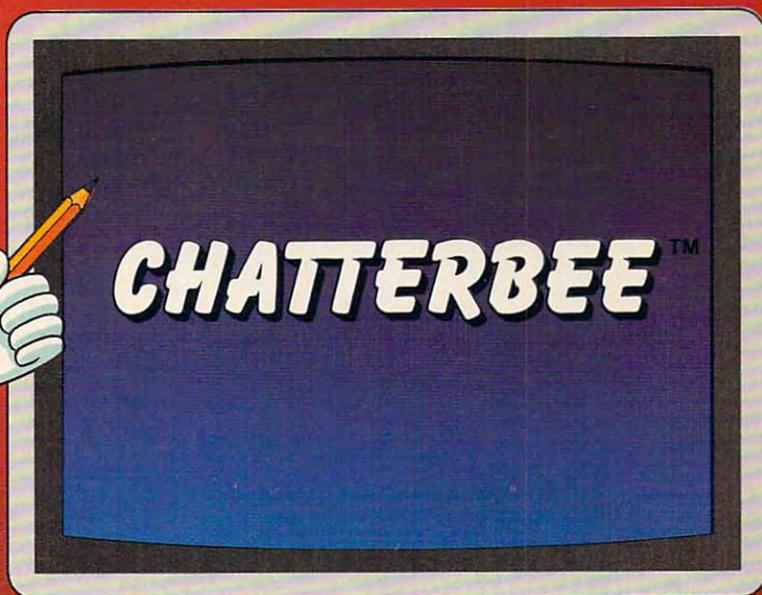
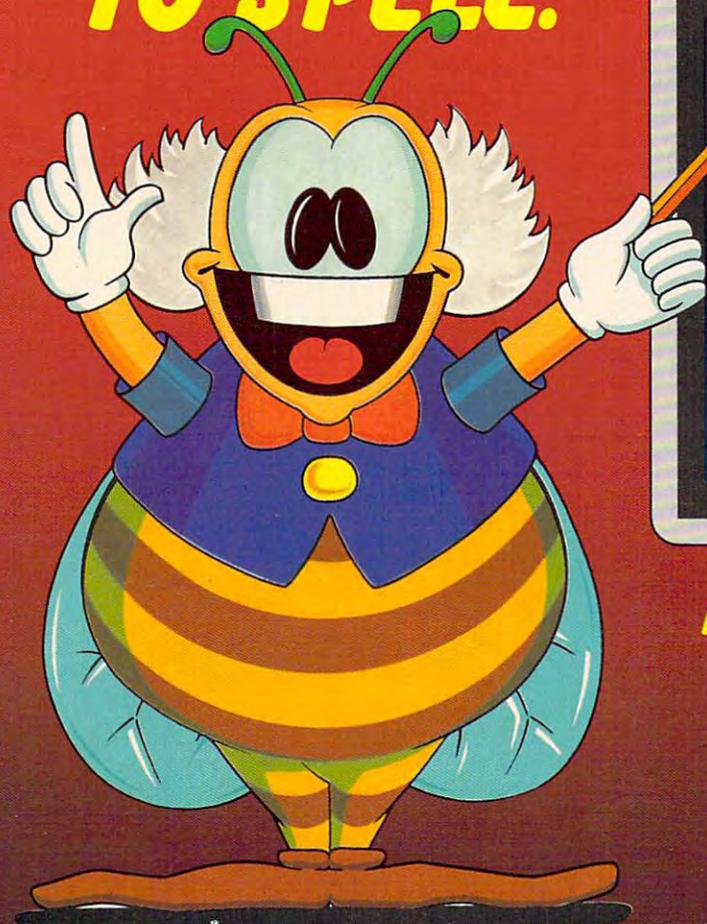
Artworx®
So you can play.

```

2000 IF PEEK(860)>=3THENSYS50712:PRINT"
{CLR}{WHT}{9 RIGHT}RIGHT PLAYER WINS
":GOTO2020
2010 SYS50712:PRINT"{CLR}{WHT}{9 RIGHT}LE
FT PLAYER WINS"
2020 POKE53272,21:POKE53248+21,0:PRINT"
{9 RIGHT}{2 DOWN}PLAY AGAIN Y OR N"
2030 H=PEEK(197):IFH<>25ANDH<>39THEN2030
2040 IFH=25THEN50
2050 SYS2048
15851 I=15872:C1=0:PRINT"{CLR}ENTERING SP
RITE DATA"
15858 READ A:IF A=256 THEN 15867
15865 POKE I,A:C1=C1+A:I=I+1:GOTO 15858
15867 IF C1<>30458THENPRINT"{CLR}ERROR DA
TA STATEMENTS (15872-16383)":END
15868 RETURN
15872 DATA 2,170,128,10,170,160,42
15879 DATA 170,168,63,255,252,42,0
15886 DATA 168,63,255,252,42,170,168
15893 DATA 10,170,160,2,170,128,0
15900 DATA 0,0,0,0,0,0,0
15907 DATA 0,0,0,0,0,0,0
15914 DATA 0,0,0,0,0,0,0
15921 DATA 0,0,0,0,0,0,0
15928 DATA 0,0,0,0,0,0,0
15935 DATA 0,2,170,128,10,170,160
15942 DATA 42,170,168,63,255,252,42
15949 DATA 0,168,63,255,252,42,170
15956 DATA 168,10,170,160,2,170,128
15963 DATA 0,0,0,0,0,0,0
15970 DATA 0,0,0,0,0,0,0
15977 DATA 0,0,0,0,0,0,0
15984 DATA 0,0,0,0,0,0,0
15991 DATA 0,0,0,0,0,0,0
15998 DATA 0,0,0,80,0,0,168
16005 DATA 0,1,84,0,1,182,0
16012 DATA 1,84,0,0,168,0,0
16019 DATA 80,0,0,0,0,0,0
16026 DATA 0,0,0,0,0,0,0
16033 DATA 0,0,0,0,0,0,0
16040 DATA 0,0,0,0,0,0,0
16047 DATA 0,0,0,0,0,0,0
16054 DATA 0,0,0,0,0,0,0
16061 DATA 0,0,0,0,80,0,0
16068 DATA 168,0,1,84,0,1,182
16075 DATA 0,1,84,0,0,168,0
16082 DATA 0,80,0,0,0,0,0
16089 DATA 0,0,0,0,0,0,0
16096 DATA 0,0,0,0,0,0,0
16103 DATA 0,0,0,0,0,0,0
16110 DATA 0,0,0,0,0,0,0
16117 DATA 0,0,0,0,0,0,0
16124 DATA 0,0,0,0,2,170,128
16131 DATA 10,170,160,42,170,168,63
16138 DATA 255,252,42,0,168,63,255
16145 DATA 252,42,170,168,10,170,160
16152 DATA 2,170,128,0,40,0,0
16159 DATA 40,0,0,170,0,10,170
16166 DATA 160,42,170,168,10,170,160
16173 DATA 0,170,0,0,0,0,0
16180 DATA 0,0,0,0,0,0,0
16187 DATA 0,0,0,0,0,2,170
16194 DATA 128,10,170,160,42,170,168
16201 DATA 63,255,252,42,0,168,63
16208 DATA 255,252,42,170,168,10,170
16215 DATA 160,2,170,128,0,40,0
16222 DATA 0,40,0,0,170,0,10
16229 DATA 170,160,42,170,168,10,170
16236 DATA 160,0,170,0,0,0,0
16243 DATA 0,0,0,0,0,0,0
16250 DATA 0,0,0,0,0,0,255
16257 DATA 255,255,255,255,255,63,0
16264 DATA 252,15,195,240,195,255,195
16271 DATA 240,255,15,252,60,63,63
16278 DATA 0,252,15,195,240,255,255
16285 DATA 255,255,255,255,0,0,0
16292 DATA 0,0,0,0,0,0,0
16299 DATA 0,0,0,0,0,0,0
16306 DATA 0,0,0,0,0,0,0
16313 DATA 0,0,0,0,0,0,0
16320 DATA 255,255,255,255,255,255,63
16327 DATA 0,252,15,195,240,195,255
16334 DATA 195,240,255,15,252,60,63
16341 DATA 63,0,252,15,195,240,255
16348 DATA 255,255,255,255,255,0,0
16355 DATA 0,0,0,0,0,0,0
16362 DATA 0,0,0,0,0,0,0
16369 DATA 0,0,0,0,0,0,0
16376 DATA 0,0,0,0,0,0,0
16383 DATA 0,0,256
49131 I=49152:C2=0:PRINT"{CLR}ENTERING MA
CHINE LANGUAGE"
49138 READ A:IF A=256 THEN 49146
49145 POKE I,A:C2=C2+A:I=I+1:GOTO 49138
49146 IFC2<>205982 THENPRINT"{CLR}ERROR I
N DATA STATEMENTS LINES (49152-5072
0):END
49147 RETURN
49152 DATA 169,0,141,92,3,141,94
49159 DATA 3,169,48,13,21,208,141
49166 DATA 21,208,169,229,141,200,207
49173 DATA 141,204,207,169,34,141,198
49180 DATA 207,169,0,141,199,207,169
49187 DATA 55,141,202,207,169,1,141
49194 DATA 203,207,169,5,141,43,208
49201 DATA 169,7,141,44,208,169,254
49208 DATA 141,252,7,141,253,7,169
49215 DATA 12,13,21,208,141,21,208
49222 DATA 169,250,141,250,7,169,251
49229 DATA 141,251,7,169,2,141,41
49236 DATA 208,141,42,208,169,0,141
49243 DATA 216,207,169,15,141,28,208
49250 DATA 169,50,141,0,208,169,120
49257 DATA 141,1,208,169,15,141,2
49264 DATA 208,169,2,13,16,208,141
49271 DATA 16,208,169,50,141,224,207
49278 DATA 169,0,141,225,207,169,15
49285 DATA 141,226,207,169,1,141,227
49292 DATA 207,169,3,13,21,208,141
49299 DATA 21,208,169,248,141,248,7
49306 DATA 169,1,141,39,208,169,2
49313 DATA 169,249,141,249,7,169,120
49320 DATA 141,3,208,120,169,184,141
49327 DATA 20,3,169,192,141,21,3
49334 DATA 88,96,162,0,32,215,192
49341 DATA 162,1,32,215,192,32,134
49348 DATA 194,32,103,195,32,65,196
49355 DATA 32,152,195,32,203,197,32
49362 DATA 22,197,76,49,234,238,37
49369 DATA 208,189,0,220,41,15,157
49376 DATA 228,207,56,169,15,253,228
49383 DATA 207,157,232,207,238,38,208
49390 DATA 160,0,200,152,221,232,207
49397 DATA 208,249,224,1,208,2,162
49404 DATA 2,152,10,168,185,10,193
49411 DATA 72,185,9,193,72,96,132
49418 DATA 194,88,194,92,194,132,194
49425 DATA 100,194,104,194,111,194,132
49432 DATA 194,96,194,125,194,118,194

```

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Space Thief Notes For 64 Version

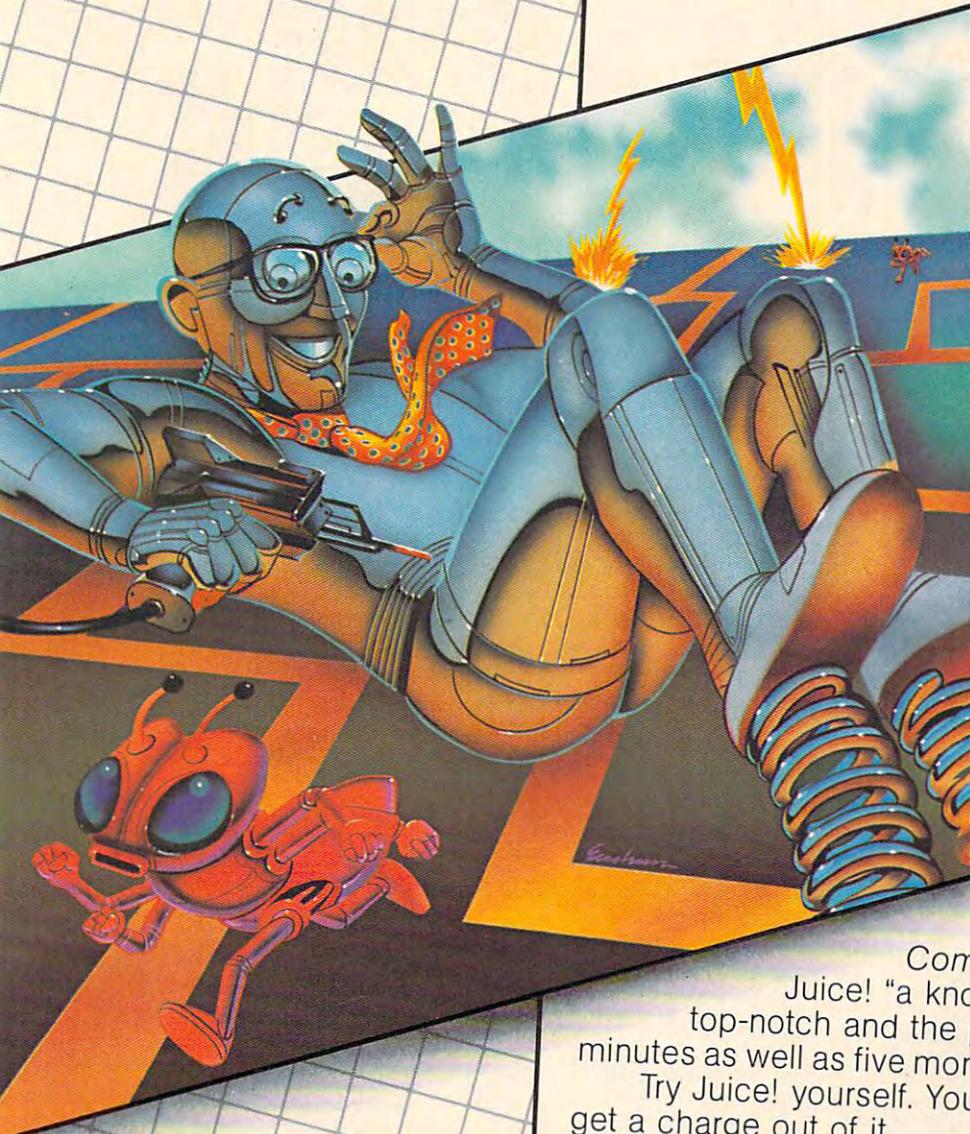
The 64 version of "Space Thief" uses an interrupt-driven ML routine which controls the position of all sprites and any collisions between them. BASIC is used to provide random numbers for the barrier's position and to keep score for both players. Points are accumulated in this version when you collect pods by touching your opponent's base and transporting the pods back to your own base. One point is awarded for each pod returned. The first player to attain three points wins.

Sound easy? There are hazards. If you are blasted by the opposing player or touch the barrier, you lose your cargo and are returned to your starting position. If you are touching your base, your opponent cannot collect or deposit a pod. Obviously, though, you will never get any points, either. The best plan is to use a combination of offensive and defensive strategies. Two joysticks are required.

49439 DATA 132,194,169,50,221,1,208
 49446 DATA 176,12,189,1,208,56,189
 49453 DATA 1,208,233,1,157,1,208
 49460 DATA 96,169,229,221,1,208,144
 49467 DATA 12,189,1,208,24,189,1
 49474 DATA 208,105,1,157,1,208,96
 49481 DATA 56,189,224,207,233,56,157
 49488 DATA 228,207,189,225,207,233,1
 49495 DATA 29,228,207,144,13,169,56
 49502 DATA 157,224,207,169,1,157,225
 49509 DATA 207,76,122,193,24,189,224
 49516 DATA 207,105,1,157,224,207,189
 49523 DATA 225,207,105,0,157,225,207
 49530 DATA 56,189,224,207,233,0,157
 49537 DATA 228,207,189,225,207,233,1
 49544 DATA 29,228,207,144,19,224,2
 49551 DATA 240,34,173,16,208,9,1
 49558 DATA 141,16,208,189,224,207,157
 49565 DATA 0,208,96,224,2,240,30
 49572 DATA 173,16,208,41,254,141,16
 49579 DATA 208,189,224,207,157,0,208
 49586 DATA 96,173,16,208,9,2,141
 49593 DATA 16,208,189,224,207,157,0
 49600 DATA 208,96,173,16,208,41,253
 49607 DATA 141,16,208,189,224,207,157
 49614 DATA 0,208,96,56,189,224,207
 49621 DATA 233,34,157,228,207,189,225
 49628 DATA 207,233,0,29,228,207,176
 49635 DATA 13,169,33,157,224,207,169
 49642 DATA 0,157,225,207,76,2,194
 49649 DATA 56,189,224,207,233,1,157
 49656 DATA 224,207,189,225,207,233,0
 49663 DATA 157,225,207,56,189,224,207
 49670 DATA 233,0,157,228,207,189,225
 49677 DATA 207,233,1,29,228,207,144

49684 DATA 19,224,2,240,34,173,16
 49691 DATA 208,9,1,141,16,208,189
 49698 DATA 224,207,157,0,208,96,224
 49705 DATA 2,240,30,173,16,208,41
 49712 DATA 254,141,16,208,189,224,207
 49719 DATA 157,0,208,96,173,16,208
 49726 DATA 9,2,141,16,208,189,224
 49733 DATA 207,157,0,208,96,173,16
 49740 DATA 208,41,253,141,16,208,189
 49747 DATA 224,207,157,0,208,96,32
 49754 DATA 33,193,96,32,53,193,96
 49761 DATA 32,73,193,96,32,209,193
 49768 DATA 96,32,33,193,32,209,193
 49775 DATA 96,32,53,193,32,209,193
 49782 DATA 96,32,53,193,32,73,193
 49789 DATA 96,32,33,193,32,73,193
 49796 DATA 96,96,56,173,190,207,233
 49803 DATA 0,141,160,207,173,191,207
 49810 DATA 233,1,13,160,207,176,17
 49817 DATA 173,16,208,41,251,141,16
 49824 DATA 208,173,190,207,141,4,208
 49831 DATA 76,184,194,173,190,207,141
 49838 DATA 4,208,169,4,13,16,208
 49845 DATA 141,16,208,173,192,207,141
 49852 DATA 5,208,56,173,194,207,233
 49859 DATA 0,141,162,207,173,195,207
 49866 DATA 233,1,13,162,207,176,17
 49873 DATA 173,16,208,41,247,141,16
 49880 DATA 208,173,194,207,141,6,208
 49887 DATA 76,240,194,173,194,207,141
 49894 DATA 6,208,169,8,13,16,208
 49901 DATA 141,16,208,173,196,207,141
 49908 DATA 7,208,56,173,198,207,233
 49915 DATA 0,141,164,207,173,199,207
 49922 DATA 233,1,13,164,207,176,17
 49929 DATA 173,16,208,41,239,141,16
 49936 DATA 208,173,198,207,141,8,208
 49943 DATA 76,40,195,173,198,207,141
 49950 DATA 8,208,169,16,13,16,208
 49957 DATA 141,16,208,173,200,207,141
 49964 DATA 9,208,56,173,202,207,233
 49971 DATA 0,141,166,207,173,203,207
 49978 DATA 233,1,13,166,207,176,17
 49985 DATA 173,16,208,41,223,141,16
 49992 DATA 208,173,202,207,141,10,208
 49999 DATA 76,96,195,173,202,207,141
 50006 DATA 10,208,169,32,13,16,208
 50013 DATA 141,16,208,173,204,207,141
 50020 DATA 11,208,96,173,0,220,41
 50027 DATA 16,208,17,173,216,207,208
 50034 DATA 12,173,68,3,41,4,208
 50041 DATA 5,169,1,141,216,207,173
 50048 DATA 1,220,41,16,208,17,173
 50055 DATA 218,207,208,12,173,68,3
 50062 DATA 41,8,208,5,169,1,141
 50069 DATA 218,207,96,173,216,207,208
 50076 DATA 47,24,173,224,207,105,20
 50083 DATA 141,190,207,173,225,207,105
 50090 DATA 0,141,191,207,173,1,208
 50097 DATA 141,192,207,173,68,3,41
 50104 DATA 1,240,6,32,234,196,32
 50111 DATA 35,197,173,21,208,41,251
 50118 DATA 141,21,208,76,59,196,173
 50125 DATA 21,208,9,4,141,21,208
 50132 DATA 56,173,190,207,233,65,141
 50139 DATA 62,3,173,191,207,233,1
 50146 DATA 13,62,3,176,70,173,68
 50153 DATA 3,41,1,240,9,32,234
 50160 DATA 196,32,35,197,76,45,196
 50167 DATA 173,64,3,41,6,201,6

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50174 DATA 208,9,32,234,196,32,68
 50181 DATA 197,76,45,196,173,68,3
 50188 DATA 41,4,240,6,32,234,196
 50195 DATA 76,45,196,24,173,190,207
 50202 DATA 105,4,141,190,207,173,191
 50209 DATA 207,105,0,141,191,207,169
 50216 DATA 1,141,216,207,96,169,0
 50223 DATA 141,216,207,173,21,208,41
 50230 DATA 251,141,21,208,96,169,0
 50237 DATA 141,216,207,96,173,218,207
 50244 DATA 208,47,56,173,226,207,233
 50251 DATA 20,141,194,207,173,227,207
 50258 DATA 233,0,141,195,207,173,3
 50265 DATA 208,141,196,207,173,68,3
 50272 DATA 41,2,240,6,32,234,196
 50279 DATA 32,68,197,173,21,208,41
 50286 DATA 247,141,21,208,76,228,196
 50293 DATA 173,21,208,9,8,141,21
 50300 DATA 208,56,173,194,207,233,30
 50307 DATA 141,66,3,173,195,207,233
 50314 DATA 0,13,66,3,144,70,173
 50321 DATA 68,3,41,2,240,9,32
 50328 DATA 234,196,32,68,197,76,214
 50335 DATA 196,173,64,3,41,9,201
 50342 DATA 9,208,9,32,234,196,32
 50349 DATA 35,197,76,214,196,173,68
 50356 DATA 3,41,8,240,6,32,234
 50363 DATA 196,76,214,196,56,173,194
 50370 DATA 207,233,4,141,194,207,173
 50377 DATA 195,207,233,0,141,195,207
 50384 DATA 169,1,141,218,207,96,169
 50391 DATA 0,141,218,207,173,21,208
 50398 DATA 41,247,141,21,208,96,169
 50405 DATA 0,141,218,207,96,160,24
 50412 DATA 169,0,153,0,212,136,208

50419 DATA 250,169,15,141,24,212,169
 50426 DATA 17,141,5,212,169,248,141
 50433 DATA 6,212,169,100,141,0,212
 50440 DATA 141,1,212,169,129,141,4
 50447 DATA 212,169,128,141,4,212,96
 50454 DATA 173,30,208,141,64,3,173
 50461 DATA 31,208,141,68,3,96,169
 50468 DATA 50,141,224,207,169,0,141
 50475 DATA 225,207,173,224,207,141,0
 50482 DATA 208,173,225,207,173,16,208
 50489 DATA 41,254,141,16,208,169,248
 50496 DATA 141,248,7,96,169,30,141
 50503 DATA 226,207,169,1,141,227,207
 50510 DATA 173,226,207,141,2,208,169
 50517 DATA 2,13,16,208,141,16,208
 50524 DATA 169,249,141,249,7,96,169
 50531 DATA 0,133,251,169,4,133,252
 50538 DATA 162,0,142,78,3,173,82
 50545 DATA 3,141,75,3,232,172,74
 50552 DATA 3,173,75,3,145,251,138
 50559 DATA 205,77,3,144,21,169,32
 50566 DATA 141,75,3,238,78,3,173
 50573 DATA 78,3,201,6,144,6,173
 50580 DATA 82,3,141,75,3,24,169
 50587 DATA 212,101,252,133,252,172,74
 50594 DATA 3,169,7,145,251,56,165
 50601 DATA 252,233,212,133,252,24,165
 50608 DATA 251,105,40,133,251,165,252
 50615 DATA 105,0,133,252,56,165,251
 50622 DATA 233,232,133,2,165,252,233
 50629 DATA 7,5,2,208,171,96,173
 50636 DATA 64,3,41,51,201,18,208
 50643 DATA 5,169,253,141,249,7,173
 50650 DATA 64,3,41,51,201,34,208
 50657 DATA 15,173,249,7,201,253,208
 50664 DATA 8,169,249,141,249,7,238
 50671 DATA 92,3,173,64,3,41,51
 50678 DATA 201,33,208,5,169,252,141
 50685 DATA 248,7,173,64,3,41,51
 50692 DATA 201,17,208,15,173,248,7
 50699 DATA 201,252,208,8,169,248,141
 50706 DATA 248,7,238,94,3,96,120
 50713 DATA 169,49,141,20,3,169,234
 50720 DATA 141,21,3,88,96,256
 51179 I=51200:C3=0:PRINT"{CLR}MOVING CHAR
 ACTERS"
 51186 READ A:IF A=256 THEN 51194
 51193 POKE I,A:C3=C3+A:I=I+1:GOTO 51186
 51194 IF C3<>8822THEN PRINT"ERROR IN DATA
 STATEMENTS LINES(51200-51256)":END
 51195 SYS51200:RETURN
 51200 DATA 120,173,14,220,41,254,141
 51207 DATA 14,220,165,1,41,251,133
 51214 DATA 1,169,208,133,252,169,48
 51221 DATA 133,254,169,0,133,251,133
 51228 DATA 253,168,162,8,177,251,145
 51235 DATA 253,200,208,249,230,252,230
 51242 DATA 254,202,208,242,165,1,9
 51249 DATA 4,133,1,173,14,220,9
 51256 DATA 1,141,14,220,88,96,256
 60000 FORT=1T014:READ Z:NEXT:RETURN

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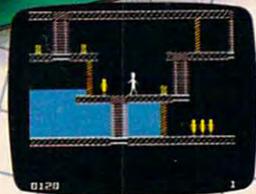
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CHOPPEROIDS

L. L. Beh

You're a chopperoid pilot on a life-and-death mission: Navigate through the deadly asteroid field to reach a disintegrating satellite with nine scientists on board. You must transport them one at a time back through the asteroid field to the safety of the heliport. Written for the Atari, a joystick or trackball is required. This game is entirely in machine language for speed and smooth motion.

When I saw what an improvement a small machine language routine made in my BASIC "Closeout" game (COMPUTE!, March 1983), I set out to learn machine language in earnest. I read all the books on machine language programming I could get my hands on, then bought an Atari Assembler Editor cartridge. "Chopperoids" is my first game written completely in machine language.

Rescue The Scientists

The problems involved in cleaning up chemical waste dumps have caused such a public outcry that all future chemical research has been banished to space. One chemical company has placed its research facilities on a satellite in geosynchronous orbit just beyond a dense asteroid field. The rationale was that the asteroids would provide a natural security system to prevent other companies from pilfering top-secret company formulas. However, an experiment on the satellite has gotten out of control and gallons of a potent solvent have leaked out. This chemical is so strong that it's causing the satellite itself to dissolve. Nine scientists are trapped on board, and you must take to your chopperoid and brave the asteroid field to save them.

Playing The Game

You will be creating a boot tape or boot disk for this game. To begin, remove BASIC or any other

cartridges from your Atari. For cassette, put the tape in the recorder, then turn on the computer while holding down the START key. When the Atari beeps, press play on the recorder. For disk, power up the disk drive, insert the boot disk, then turn on the computer. When the game is loaded, you will see a title screen for a few seconds while the game initializes.

Press the SELECT key to choose one of three levels of play. The higher the level, the more asteroids you must dodge. Press the START key to energize the first of your three chopperoids. It will appear in blue on the heliport at the bottom center of the screen, while your remaining chopperoids stand by in the lower-left corner. Maneuver the chopperoid with a joystick plugged into port 1. You have full control in any direction. If you have a trackball, you may find it to be a better controller for this game than a joystick.

Your goal is to navigate through the asteroid field to the landing pad of the satellite at the top left of the screen. Collision with an asteroid will force you to make a crash landing and switch to a new chopperoid. When you have landed, one of the stranded scientists will run out and board your chopperoid, which then turns red. You must deliver your passenger safely through the asteroid field to the heliport at the bottom of the screen. When you land at the heliport, the rescued scientist will alight from your chopperoid and run into the base station, leaving your chopperoid ready for another mission. You get 50 points for each scientist rescued and a 250-point bonus for rescuing all nine.

Fortunately for you as the chopperoid pilot, your craft is not defenseless. Use the fire button to blast any asteroids that come too close to your chopperoid. You will be awarded extra points for each disintegrated asteroid based on its size and speed. But you can't spend too much time blasting

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asteroids because all the while the research satellite is melting away. You have only a matter of minutes before it's all gone.

When all nine scientists have been rescued, the game begins again with a new satellite. There's no rest for the weary chopperoid pilot. If you fail to rescue all nine scientists before the satellite completely melts away, or if you crash all three chopperoids before rescuing all the scientists, the game ends. If you've managed to beat the high score, your total will replace the current high value.

The game can be restarted at any time by pressing the START key. The SYSTEM RESET key will only take you back to the title screen, so you must turn off the computer when you are finished playing.

Program Development

In writing Chopperoids, I am deeply indebted to John Palevich for his program "Shoot," which appeared in COMPUTE! (September 1981). This program provided significant insight into creating self-booting machine language games.

Chopperoids makes use of Atari's Display List Interrupts (DLIs) and Vertical Blank Interrupts (VBIs). The DLI is used to move and change the color of the asteroids, and to check for collisions. In level 3 there can be up to 27 asteroids on the screen at once in all different colors. The VBI is used to update the score, check the remaining time, create the game sounds, and change the speed and shape of the asteroids flying across the screen. During the main loop of the program, the joystick is read, the helicopter is moved, and the satellite is "melted."

Typing In The Program

Since Chopperoids is written entirely in machine language, it cannot be typed in directly like a program in BASIC. You must use the MLX: Machine Language Editor found elsewhere in this issue. Be sure to read and understand the MLX article before attempting to enter Chopperoids.

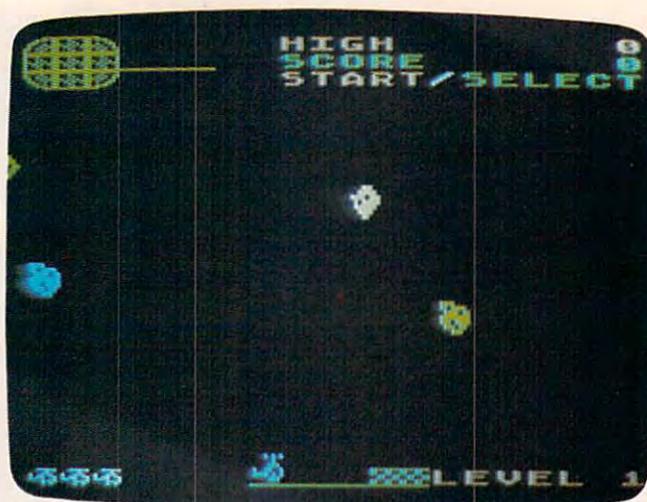
When you run MLX, it will ask you several questions. Here are the proper answers for Chopperoids:

```
starting address: 3584
ending address: 6122
run/init address: 3606
```

You should then select the option to create a boot disk or boot tape. Follow the instructions provided by the MLX program and enter the Chopperoids data. MLX will prevent any typing errors.

Chopperoids

```
3584:000,021,226,013,022,014,040
3590:169,226,141,231,002,133,140
3596:014,169,013,141,232,002,071
3602:133,015,169,022,133,010,244
```



"Chopperoids" is a fast-action machine language game for the Atari.

```
3608:169,014,133,011,024,096,215
3614:000,020,000,014,008,014,086
3620:024,096,169,060,141,002,016
3626:211,169,022,133,010,169,244
3632:014,133,011,096,076,193,059
3638:018,112,112,112,070,000,222
3644:024,006,006,240,112,240,176
3650:112,240,112,240,112,240,098
3656:112,240,112,240,112,240,104
3662:112,240,112,240,112,006,132
3668:065,025,014,032,091,067,122
3674:093,032,049,057,056,051,172
3680:032,067,079,077,080,085,004
3686:084,069,032,032,032,067,162
3692:072,079,080,080,069,242,218
3698:239,233,228,032,076,069,223
3704:086,069,076,032,036,037,200
3710:038,032,032,032,037,037,078
3716:037,041,041,041,039,037,112
3722:040,032,032,032,033,033,084
3728:033,032,032,032,083,084,184
3734:065,082,084,047,083,069,068
3740:076,069,067,084,041,041,022
3746:041,041,035,035,077,069,204
3752:078,032,076,069,070,084,065
3758:032,032,032,032,072,073,191
3764:071,072,032,032,083,067,025
3770:079,082,069,032,136,024,096
3776:058,088,154,248,184,074,230
3782:218,104,230,170,232,042,170
3788:070,024,138,200,090,184,142
3794:182,216,072,106,166,234,162
3800:040,120,218,248,000,000,074
3806:000,000,000,000,000,000,222
3812:000,000,000,000,000,000,228
3818:000,000,000,000,000,000,234
3824:000,000,000,000,000,000,240
3830:000,000,000,000,000,000,246
3836:000,000,000,000,000,000,252
3842:000,000,000,000,000,000,002
3848:000,000,000,000,000,000,008
3854:000,000,000,000,000,000,014
3860:000,000,000,000,000,000,020
3866:000,000,000,000,000,000,026
3872:000,000,000,000,000,000,032
```

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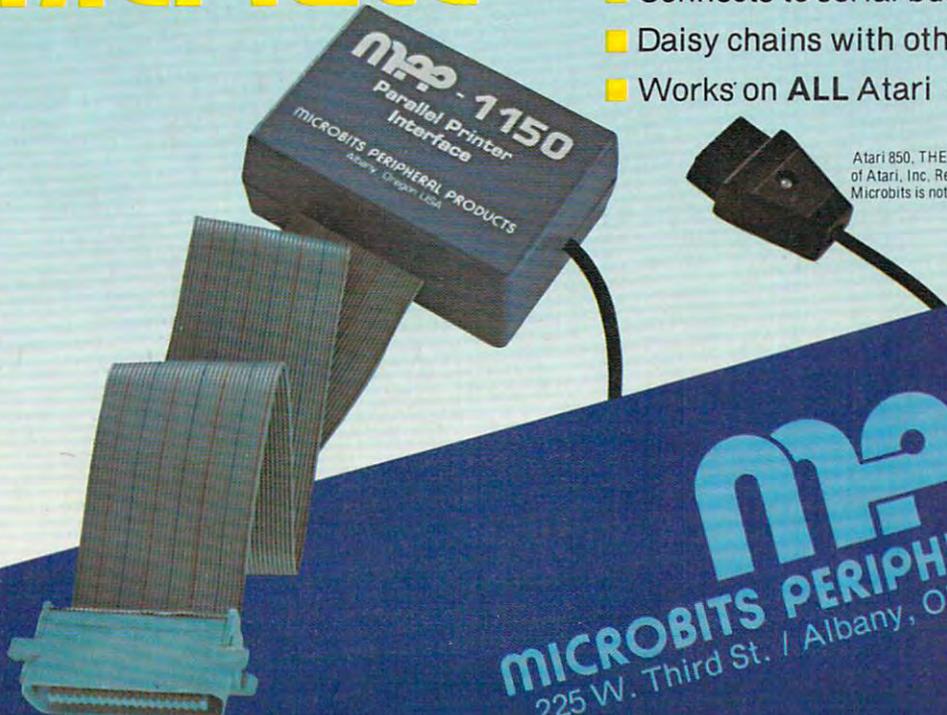
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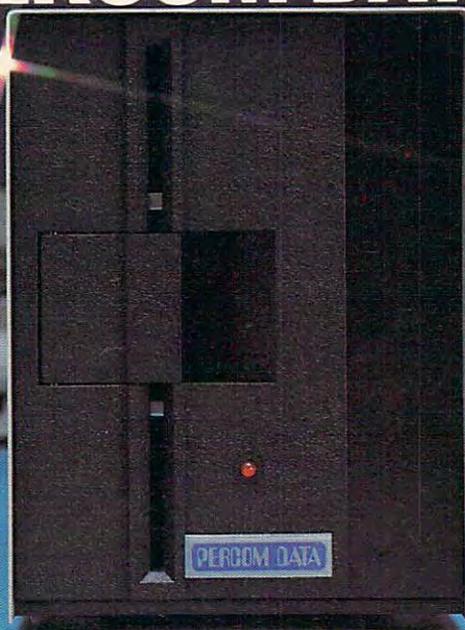
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3878:000,000,000,000,000,000,000,038
3884:000,000,000,000,000,000,000,044
3890:000,000,000,000,000,000,028,078
3896:062,247,095,126,060,024,158
3902:000,030,124,223,247,110,028
3908:062,028,000,240,222,123,231
3914:255,239,118,028,000,000,202
3920:024,060,118,108,056,000,190
3926:000,000,056,108,126,054,174
3932:028,000,000,016,056,108,044
3938:060,024,000,000,001,005,188
3944:000,000,255,005,000,000,108
3950:001,010,024,000,255,010,154
3956:024,000,002,015,008,000,165
3962:254,015,008,000,002,020,165
3968:032,000,255,020,040,000,219
3974:003,025,016,000,254,025,201
3980:016,000,000,021,004,014,195
3986:153,245,014,000,000,010,056
3992:004,142,025,245,014,000,070
3998:000,021,004,012,042,050,031
4004:012,000,000,010,004,044,234
4010:010,050,012,000,000,042,028
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4034:084,124,040,000,000,040,226
4040:016,040,084,124,040,000,248
4046:000,168,032,048,084,076,102
4052:048,000,000,080,032,052,168
4058:080,076,048,000,000,168,078
4064:032,113,152,175,112,000,040
4070:000,080,032,112,153,175,014
4076:112,000,000,031,004,078,205
4082:091,121,015,010,007,006,236
4088:006,031,031,025,025,255,109
4094:255,204,204,051,051,204,199
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4652:208,244,230,139,076,142,059
4658:018,189,072,015,153,230,215
4664:014,189,073,015,153,004,248

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4688:076,142,018,164,140,192,044
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4706:072,015,153,240,014,189,013
4712:073,015,153,014,015,169,031
4718:000,153,210,014,189,074,238
4724:015,170,152,024,105,004,074
4730:010,010,010,168,169,008,241
4736:133,141,189,024,015,153,015
4742:128,027,232,200,198,141,036
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4820:159,029,246,254,168,104,148
4826:170,152,164,147,096,169,092
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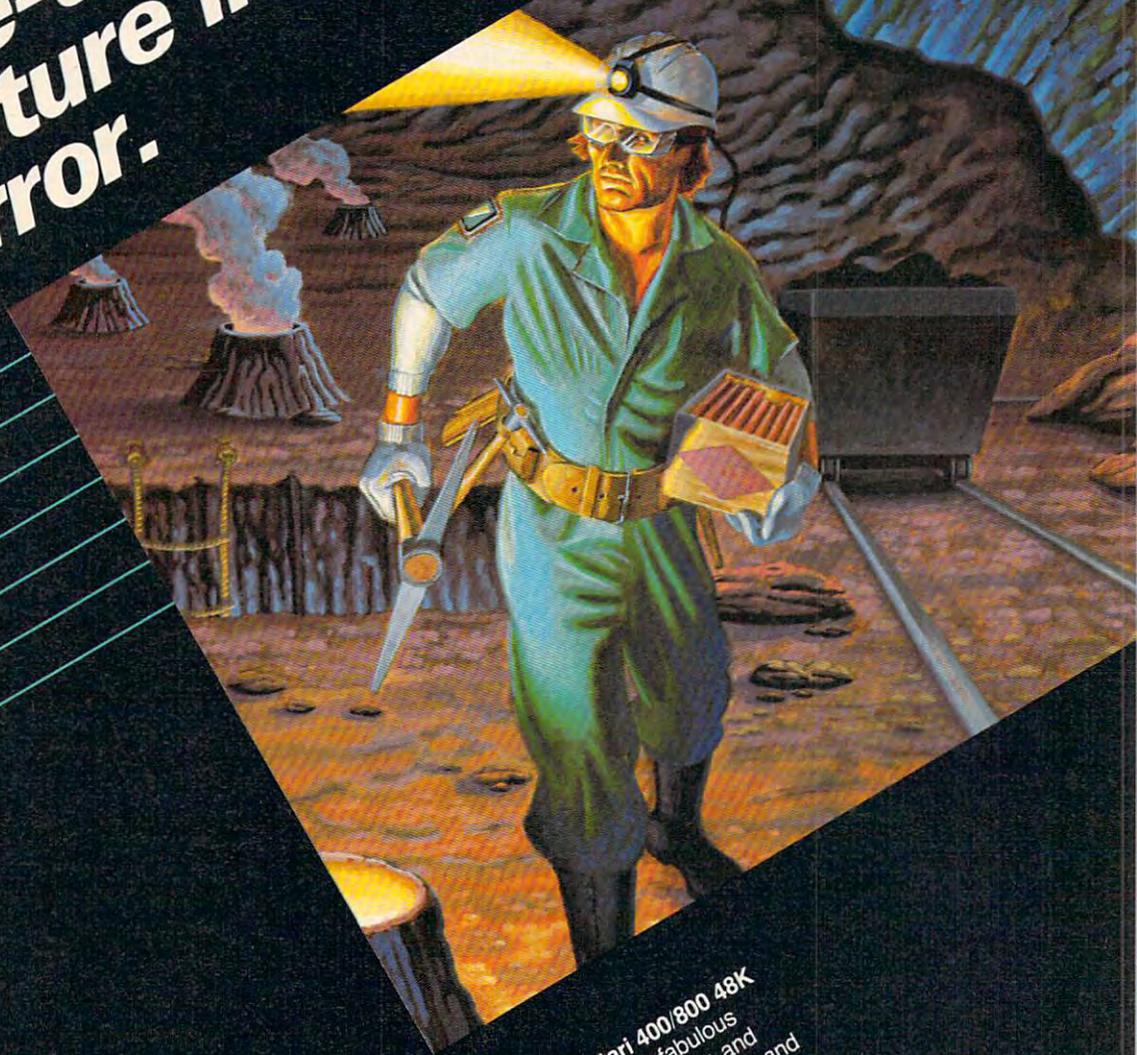
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4880:208,235,169,000,162,008,030
4886:157,255,207,202,208,250,021
4892:169,028,141,244,002,141,241
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4910:169,003,141,029,208,169,253
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4958:169,067,141,000,002,162,123
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SPELUNKER™

A spine-tingling adventure in a cavern of terror.



Spelunker. It's the fantastic new discovery game for the Atari 400/800 48K Disk with thirty continuous screens of action! The challenge: a fabulous treasure waits somewhere deep within the earth. You are the Spelunker, and between you and riches beyond imagination are darkness and death. Traps and barriers, restless ghosts of spelunkers who lost their way, and other fearful dangers lurk at every turn. Only the skillful and the brave will ever reach the hidden treasure alive.

The deeper you descend, the more difficult and dangerous the challenge. In fact, Spelunker is a joystick controlled journey through an underground nightmare. Spelunker is designed to keep players enthralled through thousands of excursions into its mysterious cavern of terror. With incredibly detailed arcade style graphics and super sound effects, Spelunker is the game of the year, and for years to come.

MICROGRAPHICIMAGE

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5462:023,198,153,208,005,134,039
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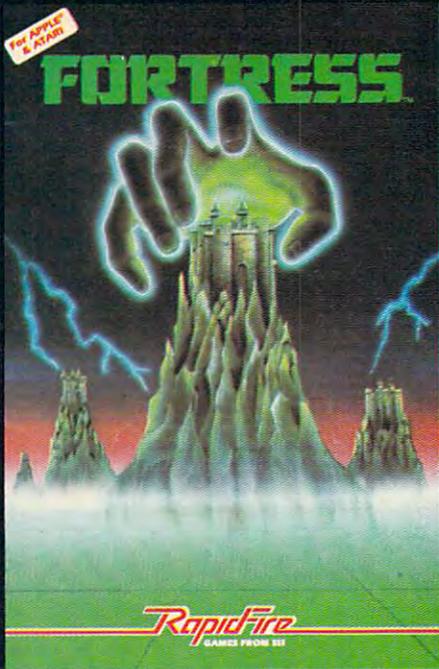
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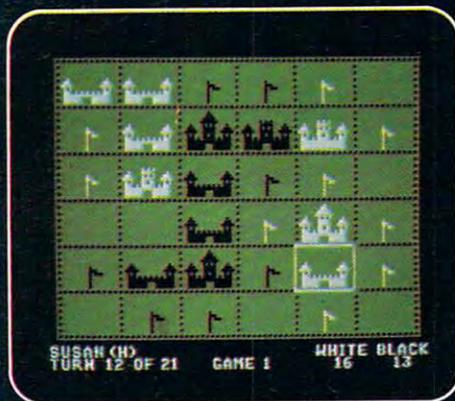
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This two-player game also contains a great solitaire scenario. Five different computer opponents are provided, each endowed with a unique style of play. For example, there is the ruthlessly aggressive Genghis Khan and Lord Maginot, the master of defense.

The crowning glory is that the computer opponents not only play, they *learn and improve* as they play you. The better you get, the better they get! Which brings forth a most fascinating event:



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Since you teach the computer opponents every time you play them, they are really an extension of yourself. SSI proudly announces a very different kind of strategy game tournament: computer versus computer! Send us the disk of your best trained computer player and we'll match it against other entries. The winner (the human, not his disk!) of this battle of electronic wits will win \$1,000! Complete details in each **FORTRESS** box.

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On disk for the Apple® II with Applesoft ROM Card, Apple II Plus, IIe, and III.

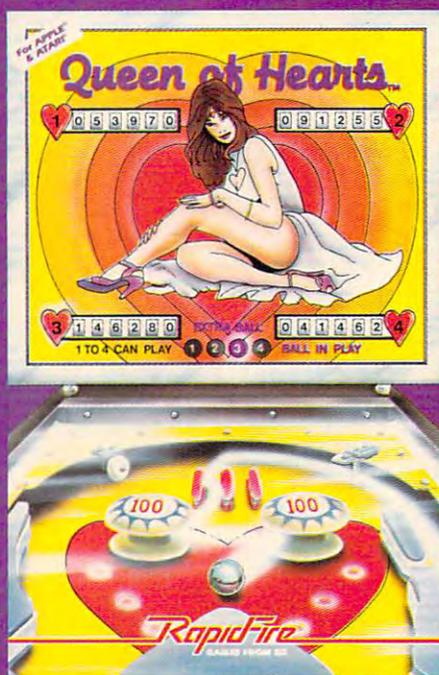
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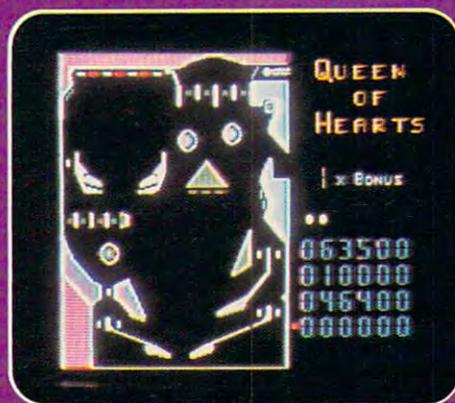
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QUEEN OF HEARTS™ (\$34.95) is dedicated to all you pinball players out there. Just look at what it offers:

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See above for Apple® specifications. On disk for the 48K Atari® 400/800/1200 with 2 joysticks.

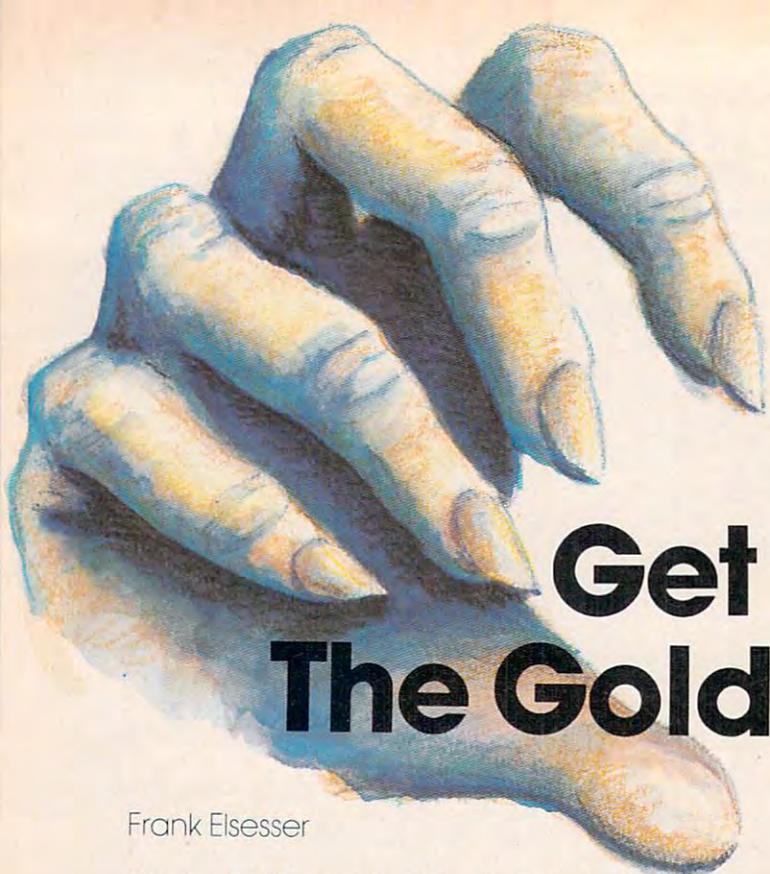


If there are no convenient stores near you, VISA & Mastercard holders can order direct by calling **800-227-1617, ext. 335 (toll free)**. In California, call 800-772-3545, ext. 335. To order by

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Get The Gold

Frank Elsesser

Here's a TI-99 version of the classic dungeon adventure game, complete with perfidious monsters, cunning thieves, and dangerous trap doors. The game also includes some pretty eerie sound effects.

If you're brave enough, this game will take you into a two-level, 128-chamber dungeon on a quest for treasure. You may come out rich, or you may not come out at all. Finding your way through the passages might seem simple enough if you were alone in the dungeon, but there are monsters hiding in some of the chambers. In others, thieves will attempt to steal part of your hard-won gold. Some chambers have trap doors in the floor which drop you back to a lower level or send you plummeting into deep pits.

Since the game is quite long, it is divided into two segments. The first part (Program 1) gives detailed instructions on playing, and the second part (Program 2) is the game itself. You should first type in Program 1 and, after checking for errors, SAVE it to tape. Don't rewind the tape. Next, type in Program 2. After correcting any typing errors, SAVE Program 2 immediately after Program 1 on the same tape. When you load and run Program 1, it will give you instructions on loading the second part.

If you do not want to type in the programs, send a blank cassette, a self-addressed stamped mailer, and \$3 to:

Frank Elsesser
1307 Douglas Drive
Sterling, IL 61801

Program 1: Game Instructions

```
100 CALL SCREEN(2)
110 CALL CLEAR
120 FOR C=1 TO 8
130 CALL COLOR(C,16,2)
140 NEXT C
150 PRINT "{7 SPACES}GET THE GOLD":
:::::
160 PRINT "INSTRUCTIONS.....
...."::::::
170 FOR J=1 TO 11
180 READ A,B,C
190 CALL SOUND(A,B,0,C,0)
200 NEXT J
210 DATA 125,262,131,125,294,131,25
0,156,131,250,131,147,250,262,1
31,100,262,131
220 DATA 100,294,123,100,311,131,10
0,392,131,100,294,131,100,311,1
31,200,131,262
230 CALL SOUND(200,131,0,262,3,523,
3)
240 FOR DELAY=1 TO 500
250 NEXT DELAY
260 CALL CLEAR
270 PRINT "GET THE GOLD IS AN ADVEN
TURE": "GAME, WHERE THE PLAYER
MUST": "ANSWER CERTAIN QUESTION
S AS":
280 PRINT "HE WANDERS THROUGH THE":
"CHAMBERS AND TUNNELS OF A": "
TWO-LEVEL MAZE."::::::
290 PRINT "PRESS ANY KEY TO CONTINU
E...":
300 CALL KEY(0,K,S)
310 IF S=0 THEN 300
320 CALL CLEAR
330 PRINT "THE PROGRAM"
340 PRINT "----"
350 PRINT
360 PRINT "YOU ARE GIVEN 1,000 GOLD
": "PIECES, AND THEN TRANSPORTED
": "TO THE LOWER LEVEL OF A 128-
":
370 PRINT "CHAMBER, TWO-LEVEL DUNGE
ON": "(64 CHAMBERS PER LEVEL).":
380 PRINT "YOUR GOAL IS TO ESCAPE W
ITH": "AS MUCH GOLD AS POSSIBLE.
": "GOLD PIECES ARE ACQUIRED BY":
390 PRINT "ANSWERING THE QUESTION A
SKED": "BY THE MONSTERS THAT INH
ABIT": "THE DUNGEON.":
400 PRINT "EACH TIME AN ANSWER IS":
"CORRECT, GOLD IS GIVEN AS A":
REWARD. IF THE ANSWER IS":
410 PRINT "INCORRECT, THEN GOLD IS"
:"TAKEN AWAY.":
420 PRINT "PRESS ANY KEY TO CONTINU
E..."
430 CALL KEY(0,K,S)
440 IF S=0 THEN 430
```



```

450 CALL CLEAR
460 PRINT "THE QUESTION"
470 PRINT "----"
480 PRINT
490 PRINT "THE MONSTERS WILL ASK YOU": "ONE SPECIAL QUESTION AS YOU": "TRAVEL THROUGH THE DUNGEON"
500 PRINT "WHERE IS THE GOLD?": "HINT: WHERE WOULD YOU PUT": "1, 000 GOLD PIECES IF YOU":
510 PRINT "WERE CARRYING THEM?": "PRESS ANY KEY TO CONTINUE..."
520 CALL KEY(0,K,S)
530 IF S=0 THEN 520
540 CALL CLEAR
550 PRINT "MOVES"
560 PRINT "-----"
570 PRINT
580 PRINT "AS YOU MOVE THROUGH THE": "DUNGEON YOU WILL ENCOUNTER": "MONSTERS, THIEVES, EMPTY":
590 PRINT "CHAMBERS, TRAP DOORS, SECRET": "DOORS LEADING INTO NORTH": "SOUTH AND EAST-WEST TUNNELS",
600 PRINT "AND SUPER KEYS.": "TO MOVE, ENTER THE LETTER": "IN PARENTHESES FOR THE": "DESIRED MOVE OR ACTION":
610 PRINT "1- (N)ORTH{3 SPACES}2- (E)AST": "3- (S)OUTH{3 SPACES}4- (W)EST": "5- (Q)UIT [ENDS GAME]"
620 PRINT "6- (G)OLD [GIVES GOLD COUNT]": "7- (U)P [USED AT STAIRWAYS]":
630 PRINT "PRESS ANY KEY TO CONTINUE..."
640 PRINT
650 CALL KEY(0,K,S)
660 IF S=0 THEN 650
670 CALL CLEAR
680 PRINT "GAME RATING"
690 PRINT "-----"
700 PRINT
710 PRINT "AFTER YOU COMPLETE THE GAME,": "A GAME RATING IS DISPLAYED,": "ALONG WITH THE NUMBER OF":
720 PRINT "GOLD PIECES ACQUIRED AND": "NUMBER OF TURNS IT TOOK YOU": "TO FIND YOUR WAY OUT.":
730 PRINT "THE RATING WILL BE SOMEWHERE": "BETWEEN -500 AND +1000. THE": "HIGHER THE NUMBER, THE":
740 PRINT "BETTER THE RATING. A": "NEGATIVE NUMBER INDICATES A": "POOR RATING.": "GOOD LUCK!!!!"
750 PRINT "PRESS ENTER....."
760 CALL KEY(0,K,S)
770 IF S=0 THEN 760
780 CALL CLEAR
790 PRINT "TO PLAY:": "{4 SPACES}TYPE NEW, THEN OLD CS1":
800 FOR DELAY=1 TO 1000
810 NEXT DELAY

```

Program 2: Get The Gold

```

100 CALL CLEAR
110 FOR CC=1 TO 8
120 CALL COLOR(CC,5,11)
130 NEXT CC
140 CALL SCREEN(11)
160 FOR DDD=1 TO 500
170 NEXT DDD
180 CALL CLEAR
190 PRINT "GET THE GOLD!": "AN ENCHANTED ADVENTURE":
200 PRINT "AN ENCHANTED ADVENTURE":
210 FOR J=1 TO 2
220 IA=200
230 CALL SOUND(IA,131,0,262,3,523,3)
240 CALL SOUND(IA,147,0,294,3,587,3)
250 CALL SOUND(IA,131,0,311,3,622,3)
260 CALL SOUND(IA,156,0,311,3,622,3)
270 CALL SOUND(IA,131,0,294,3,587,3)
280 CALL SOUND(IA,156,0,294,3,587,3)
290 CALL SOUND(IA*2,131,0,262,3,523,3)
300 CALL SOUND(IA,156,0,262,3)
310 CALL SOUND(IA,123,0,294,3)
320 CALL SOUND(IA,131,0,311,3)
330 CALL SOUND(IA,156,0,392,3)
340 CALL SOUND(IA,131,0,294,3)
350 CALL SOUND(IA,156,0,311,3)
360 CALL SOUND(IA*2,131,0,262,3)
370 NEXT J
380 CALL CLEAR
390 CALL SCREEN(14)
400 FOR CC=1 TO 8
410 CALL COLOR(CC,16,14)
420 NEXT CC
430 DIM P(9,9,2)
440 PRINT "YOU WILL BE TAKEN TO":
450 PRINT "THE DUNGEON":
460 FOR DELAY=1 TO 500
470 NEXT DELAY
480 CALL CLEAR
490 RANDOMIZE
500 MA=0
510 CA=0
520 G=1000
530 M1=1
540 K=0
550 PRINT "WHO ART THOU?":
560 INPUT A$
610 CALL CLEAR
620 GOSUB 860
630 CALL SCREEN(7)
640 FOR CC=1 TO 8
650 CALL COLOR(CC,16,7)
660 NEXT CC
670 PRINT "YOU CARRY 1000 GOLD PIECES WITH YOU":
680 GOSUB 860
690 PRINT A$; ". . . OFF YOU GO . . ."
700 GOSUB 860
710 GOSUB 900
720 CALL CLEAR
730 CALL SCREEN(2)
740 FOR CC=1 TO 8
750 CALL COLOR(CC,16,2)
760 NEXT CC
770 PRINT "YOU HAVE ARRIVED AT . . ."
780 PRINT "THE DUNGEON . . . BOTTOM LEVEL":
790 PRINT "YOU WILL COME ACROSS {8 SPACES}MONSTERS":
800 PRINT "THIEVES, AND GOLD. . . BUT WATCH":
810 PRINT "YOUR STEP . . ."

```

```

820 PRINT "TRAP DOORS CAN BE COSTLY.
      ."
830 FOR AB=1 TO 2000
840 NEXT AB
850 GOTO 1840
860 REM
870 FOR Z2=1 TO 400
880 NEXT Z2
890 RETURN
900 REM
910 FOR X=1 TO 8
920 FOR Y=1 TO 8
930 FOR Z=1 TO 2
940 P(X,Y,Z)=INT(RND*7)+1
950 NEXT Z
960 NEXT Y
970 NEXT X
980 REM
990 H=INT(RND*3)+1
1000 FOR A=1 TO 2
1010 FOR N=1 TO H
1020 X=INT(RND*8)+1
1030 Y=INT(RND*8)+1
1040 P(X,Y,A)=8
1050 NEXT N
1060 NEXT A
1070 S=INT(RND*4)+2
1080 FOR A=1 TO 2
1090 FOR N=1 TO S
1100 X=INT(RND*8)+1
1110 Y=INT(RND*8)+1
1120 P(X,Y,A)=9
1130 NEXT N
1140 NEXT A
1150 RETURN
1160 REM
1170 L1=L1-1
1180 PRINT "YOU WALK UP THE STAIRWAY.
      ...":
1190 N=1
1200 X=INT(RND*5)
1210 IF X=2 THEN 1270
1220 CALL SOUND(5,-3,5)
1230 CALL SOUND(30,-7,20)
1240 CALL SOUND(500,-7,30)
1250 N=N+1
1260 IF N=15 THEN 1290 ELSE 1200
1270 CALL SOUND(60,-7,20)
1280 GOTO 1240
1290 REM
1300 GOSUB 860
1310 CALL SCREEN(11)
1320 FOR CC=1 TO 8
1330 CALL COLOR(CC,5,11)
1340 NEXT CC
1350 PRINT "YOU PUT THE SUPER KEY INTO
      THE LOCK . . . . ."
      ::
1360 GOSUB 860
1370 PRINT "THE DOOR IS OPEN":
1380 CALL SOUND(125,131,0)
1390 CALL SOUND(125,147,0)
1400 CALL SOUND(500,165,0)
1410 CALL SOUND(250,165,0)
1420 CALL SOUND(250,165,0)
1430 CALL SOUND(250,147,0)
1440 CALL SOUND(250,165,0)
1450 CALL SOUND(750,175,0)
1460 CALL SOUND(500,165,0)
1470 FOR A=0 TO 30 STEP 5
1480 CALL SOUND(-99,698,A,1924,A)
1490 NEXT A
1500 FOR A=0 TO 30 STEP 5
1510 CALL SOUND(-99,554,A,1527,A)
1520 NEXT A
1530 GOSUB 860
1540 IF L1=0 THEN 1620
1550 MA=0
1560 K=0
1570 K4=INT(RND*4)+4
1580 CB=CA+K4
1590 PRINT "YOU ARE AT . . . THE UPPER
      LEVEL":
1600 GOSUB 860
1610 GOTO 1900
1620 PRINT "YOU FOUND YOUR WAY . . .
      . . .":
1630 PRINT "OUT OF THE DUNGEON":
1640 CALL SOUND(1000,262,2,330,2,392,
      2)
1650 CALL SOUND(1000,349,2,392,2,440,
      2)
1660 PRINT "YOU HAVE ACQUIRED ";G;" GOLD
      PIECES.":
1670 FOR J=1 TO 11
1680 READ MMM,NNN,000
1690 CALL SOUND(MMM,NNN,0,000,0)
1700 NEXT J
1710 DATA 125,262,131,125,294,131,250
      ,156,131,250,131,147,250,262,131
      ,100,262,131
1720 DATA 100,294,123,100,311,131,100
      ,392,131,100,294,131,100,311,131
      ,125,262,131,200,131,262
1730 CALL SOUND(200,131,0,262,3,523,3
      )
1740 GOSUB 1760
1750 GOTO 2690
1760 GG=G+100
1770 R=INT((GG*CA-7000+1)/M1)
1780 PRINT
1790 PRINT "YOUR RATING IS ";R
1800 PRINT
1810 IF G<=0 THEN 5380
1820 PRINT "IT TOOK YOU ";M1;"
      {10 SPACES}TURNS TO FIND THE WAY
      OUT":
1830 RETURN
1840 REM
1850 C=INT(RND*8)+1
1860 D=INT(RND*8)+1
1870 P(C,D,2)=1
1880 L1=2
1890 K4=INT(RND*4)+4
1900 CALL CLEAR
1910 A=P(C,D,L1)
1920 GOSUB 860
1930 ON A GOSUB 2960,3010,3060,3060,3
      140,3730,3800,3860,4170
1940 PRINT
1950 IF G<=0 THEN 2570
1960 PRINT A$;" WHAT IS YOUR ACTION?
      "
1970 PRINT
1980 PRINT "(N)ORTH, (S)OUTH, (E)AST,
      {3 SPACES}(W)EST, (U)P, (G)OLD,
      OR{4 SPACES}(Q)UIT":
1990 CALL KEY(0,K,S)
2000 IF S=0 THEN 1990
2010 CALL CLEAR
2020 M1=M1+1
2030 IF M1>=140/L1 THEN 5270
2040 IF K=78 THEN 2150
2050 IF K=69 THEN 2200
2060 IF K=83 THEN 2250
2070 IF K=87 THEN 2300
2080 IF K=85 THEN 2350
2090 IF K=71 THEN 2410

```

```

2100 IF K=81 THEN 2120
2110 GOTO 1960
2120 END
2130 PRINT
2140 GOTO 1940
2150 REM
2160 IF A=7 THEN 2450
2170 IF (D-1)=0 THEN 2780
2180 D=D-1
2190 GOTO 1900
2200 REM
2210 IF A=6 THEN 2510
2220 IF (C+1)=9 THEN 2840
2230 C=C+1
2240 GOTO 1900
2250 REM
2260 IF A=7 THEN 2450
2270 IF (D+1)=9 THEN 2880
2280 D=D+1
2290 GOTO 1900
2300 REM
2310 IF A=6 THEN 2510
2320 IF (C-1)=0 THEN 2920
2330 C=C-1
2340 GOTO 1900
2350 CALL CLEAR
2360 IF A<>9 THEN 2380
2370 IF K>-1 THEN 1160
2380 PRINT "YOU ARE NOT AT A STAIRWAY
.":
2390 GOSUB 860
2400 REM
2410 REM
2420 CALL CLEAR
2430 PRINT "YOU HAVE ";G;" GOLD PIECE
S.":
2440 GOTO 1940
2450 REM
2460 PRINT
2470 CALL CLEAR
2480 PRINT "YOU ARE IN AN EAST-WEST
{5 SPACES}TUNNEL":
2490 PRINT "YOU CAN ONLY GO EAST OR W
EST":
2500 GOTO 1940
2510 REM
2520 PRINT
2530 CALL CLEAR
2540 PRINT "YOU ARE IN A NORTH-SOUTH
{4 SPACES}TUNNEL":
2550 PRINT "YOU CAN ONLY GO NORTH OR
{4 SPACES}SOUTH":
2560 GOTO 2500
2570 REM
2580 GOSUB 860
2590 PRINT
2600 CALL SOUND(250,139,2)
2610 CALL SOUND(10,2000,2)
2620 CALL SOUND(250,139,2)
2630 CALL SOUND(10,2000,2)
2640 CALL SOUND(500,185,2)
2650 PRINT "YOU LOST ALL YOUR GOLD AN
D YOU WERE":
2660 PRINT ". . . UNABLE TO ESCAPE
{4 SPACES}THE DUNGEON IN TIME.":
:
2670 PRINT "MAYBE NEXT TIME":
2680 GOSUB 1760
2690 PRINT
2700 PRINT "ANOTHER GAME?":
2710 PRINT "ENTER '1'-YES '0'-NO":
2720 INPUT AA
2730 CALL CLEAR
2740 IF AA<>1 THEN 2770

2750 CALL CLEAR
2760 GOTO 450
2770 END
2780 CALL CLEAR
2790 PRINT "YOU ARE AT THE NORTH WALL
":
2800 CALL SOUND(-500,400,2,-4,2)
2810 PRINT "YOU CANNOT PASS THROUGH":
:
2820 PRINT "TRY ANOTHER DIRECTION.":
2830 GOTO 1940
2840 CALL CLEAR
2850 PRINT "YOU ARE AT THE EAST WALL"
:
2860 CALL SOUND(-500,400,2,-4,2)
2870 GOTO 2810
2880 CALL CLEAR
2890 PRINT "YOU ARE AT THE SOUTH WALL
":
2900 CALL SOUND(-500,400,2,-4,2)
2910 GOTO 2810
2920 CALL CLEAR
2930 PRINT "YOU ARE AT THE WEST WALL"
:
2940 CALL SOUND(-500,400,2,-4,2)
2950 GOTO 2810
2960 REM
2970 PRINT
2980 PRINT "YOU ARE IN A . . . . .
. . . . .":
2990 PRINT ". . . . . EMPTY CHAMBER":
3000 RETURN
3010 REM
3020 PRINT
3030 PRINT "YOU ARE IN A SMOKEY . . .
.":
3040 PRINT ". . . . . EMPTY CHAM
BER":
3050 RETURN
3060 CALL CLEAR
3070 GOSUB 5220
3080 RANDOMIZE
3090 M4=INT(RND*10)+1
3100 GOSUB 4290
3110 ON M4 GOSUB 4410,4520,4720,4810,
4410,4720,4520,4520,4410,4810
3120 PRINT
3130 RETURN
3140 CALL CLEAR
3150 PRINT "THERE'S A THIEF IN THIS R
OOM":
3160 FOR I=1 TO 5
3170 CALL SOUND(500,110,2)
3180 CALL SOUND(-500,330,1)
3190 NEXT I
3200 P(C,D,L1)=2
3210 GOSUB 860
3220 G4=INT(350/L1*RND)+1
3230 RANDOMIZE
3240 Y=INT(RND*8)+1
3250 IF Y<=5 THEN 3600
3260 PRINT
3270 PRINT ". . . . . HE SURPRISES Y
OU.":
3280 GOSUB 860
3290 PRINT "AS HE QUICKLY RUNS BY HE"
:
3300 PRINT "STEALS . . . ";G4;" GOLD
{4 SPACES}PIECES":
3310 G=G-G4
3320 REM
3330 GOSUB 860
3340 PRINT "YOU SEARCH THE ROOM AND F
IND ":

```

```

3350 RANDOMIZE
3360 ZZZ=INT(RND*14)+1
3370 ON ZZZ GOSUB 3390,3490,3410,3430
      ,3450,3470,3490,3490,3510,3390,3
      530,3550,3570,3490
3380 GOTO 3590
3390 PRINT "A DEAD MAN"::
3400 RETURN
3410 PRINT "A MOLDY COFFIN"
3420 RETURN
3430 PRINT "A ROACH"
3440 RETURN
3450 PRINT "A SLAIN MONSTER"
3460 RETURN
3470 PRINT "A PIECE OF BREAD"
3480 RETURN
3490 PRINT "A TREASURE CHEST"::
3491 GOSUB 860
3492 PRINT "YOU OPEN THE LID.....
      .."::
3493 GOSUB 860
3494 RANDOMIZE
3495 G54=INT(RND*2000)+1
3496 PRINT "AND FIND";G54;" GOLD PIEC
      ES."
3497 G=G+G54
3498 PRINT
3500 RETURN
3510 PRINT "A TI HOME COMPUTER"
3520 RETURN
3530 PRINT "AN OLD SWORD"
3540 RETURN
3550 PRINT "A CANDLE"
3560 RETURN
3570 PRINT "THE WIZARDS REWARD-1,000
      {4 SPACES}GOLD PIECES"
3580 G=G+1000
3590 RETURN
3600 PRINT "YOU SURPRISED THE THIEF .
      ."::
3610 GOSUB 860
3620 PRINT "AS HE RUNS OUT HE DROPS .
      ."::
3630 PRINT " . . . . ";G4;" GOLD PIEC
      ES"::
3640 PRINT "YOU PICK UP THE GOLD PIEC
      ES"::
3650 G=G+G4
3660 IF M1=1 THEN 3670 ELSE 3680
3670 RETURN
3680 MA=INT(RND*4)+1
3690 IF M1<=2 THEN 3700 ELSE 3710
3700 MA=1
3710 IF MA=1 THEN 3340
3720 RETURN
3730 CALL CLEAR
3740 PRINT
3750 GOSUB 5440
3760 REM
3770 PRINT " . . . ENTER A NORTH-SOUT
      H TUNNEL"::
3780 GOSUB 5400
3790 RETURN
3800 CALL CLEAR
3810 PRINT
3820 GOSUB 5440
3830 PRINT " . . . ENTER AN EAST-WEST
      {3 SPACES}TUNNEL"::
3840 GOSUB 5400
3850 RETURN
3860 REM
3870 CALL SOUND(250,139,2)
3880 CALL SOUND(10,2000,2)
3890 CALL SOUND(250,139,2)
3900 CALL SOUND(10,2000,2)
3910 CALL SOUND(500,185,2)
3920 PRINT "YOU STEPPED ON A . . . .
      . . TRAP DOOR"::
3930 GOSUB 860
3940 TD=INT(RND*4)+1
3950 IF TD>=3 THEN 3990
3960 PRINT
3970 PRINT "BUT . . YOU CAUGHT YOURS
      ELF"::
3980 RETURN
3990 IF L1=2 THEN 4100
4000 L1=L1+1
4010 K=1
4020 PRINT "YOU FELL THRU TO . . . .
      . .THE BOTTOM LEVEL . . . . AND"
      "::
4030 G=100
4040 GOSUB 860
4050 PRINT
4060 PRINT "YOU LOST MOST OF YOUR GOL
      D PIECES"::
4070 PRINT "YOU HAVE . . . ";G;" GOLD
      {3 SPACES}PIECES LEFT"::
4080 PRINT "BUT, YOU STILL HAVE YOUR
      KEY"::
4090 RETURN
4100 PRINT "YOU FELL INTO A DEEP . .
      PIT"::
4110 GOSUB 860
4120 PRINT "YOU'RE LUCKY . . . . .
      . ."::
4130 PRINT "YOU DID'NT GET HURT"::
4140 GOSUB 860
4150 PRINT "BUT IN CLIMBING OUT . . .
      ."::
4160 GOTO 5310
4170 PRINT "YOU ARE AT A STAIRWAY"::
4180 PRINT " . . . . . GOING UP . . .
      ."::
4190 N=1
4200 FOR F=700 TO 900 STEP 5
4210 CALL SOUND(-99,F,0)
4220 NEXT F
4230 FOR F=900 TO 700 STEP -8
4240 CALL SOUND(-99,F,0)
4250 NEXT F
4260 N=N+1
4270 IF N=2 THEN 4280 ELSE 4200
4280 RETURN
4290 CALL SOUND(250,147,0,294,0)
4300 CALL SOUND(175,147,0,294,0)
4310 CALL SOUND(75,147,0,294,0)
4320 CALL SOUND(250,147,0,294,1)
4330 CALL SOUND(175,175,0,349,0)
4340 CALL SOUND(75,165,0,330,0)
4350 CALL SOUND(175,165,0,330,0)
4360 CALL SOUND(75,147,0,294,1)
4370 CALL SOUND(175,147,0,294,0)
4380 CALL SOUND(75,131,0,262,0)
4390 CALL SOUND(500,147,0,294,0,587,0
      )
4400 RETURN
4410 PRINT "HALT *** I AM DRA"::
4420 GOSUB 4860
4430 GOSUB 4900
4440 INPUT P$
4450 IF P$="BAG" THEN 4500
4460 IF P$="IN BAG" THEN 4500
4470 REM
4480 GOSUB 5080
4490 RETURN
4500 GOSUB 4930
4510 RETURN

```

```

4520 PRINT "STOP *** I AM BUS":
4530 GOSUB 4860
4540 GOSUB 4900
4550 INPUT P$
4560 IF A$="IN BAG" THEN 4600
4570 IF P$="BAG" THEN 4600
4580 GOSUB 5080
4590 RETURN
4600 GOSUB 4930
4610 RETURN
4620 GOSUB 900
4630 H=1
4640 O=9
4650 W=8
4660 B=0
4670 E=5
4680 R=14
4690 C=0
4700 PR=0
4710 GOTO 1840
4720 PRINT "HALT *** I AM LUM!!!":
4730 GOSUB 4860
4740 GOSUB 4900
4750 INPUT P$
4760 IF P$="BAG" THEN 4790
4770 GOSUB 5080
4780 RETURN
4790 GOSUB 4930
4800 RETURN
4810 PRINT "BEWARE OF TRAP DOORS":
4820 CALL SOUND(500,220,0,330,0,440,0)
4830 CALL SOUND(250,330,0,440,0,550,0)
4840 REM
4850 RETURN
4860 PRINT
4870 PRINT "*** YOU MAY NOT PASS
(8 SPACES)THROUGH UNTIL":
4880 PRINT "*** YOU TELL ME WHERE THE
(3 SPACES)GOLD IS":
4890 RETURN
4900 REM
4910 RETURN
4920 CALL CLEAR
4930 PRINT "GOOD, YOU MUST BE REWARDED
.. "
4940 PRINT
4950 G4=INT(400/L1*RND)+25
4960 K=1
4970 G=G+G4
4980 GOSUB 860
4990 PRINT "YOU WIN ";G4;" GOLD PIECE
S":
5000 GOSUB 5180
5010 P(C,D,L1)=1
5020 CA=CA+1
5030 IF K=1 THEN 5040 ELSE 5050
5040 RETURN
5050 IF CA=K4 THEN 5170
5060 IF L1=1 THEN 5290
5070 RETURN
5080 PRINT
5090 PRINT "YOU LIE":
5100 PRINT "NO REWARD FOR YOU":
5110 PRINT
5120 G4=INT(350/L1*RND)+1
5130 G=G-G4
5140 GOSUB 860
5150 PRINT "I WIN ";G4;" GOLD PIECES"
:
5160 RETURN
5170 GOSUB 860
5180 K=1
5190 PRINT "YOU HAVE FOUND THE SUPER
KEY":

```

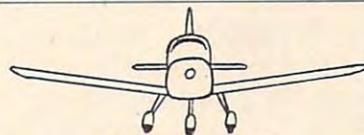
```

5200 GOSUB 860
5210 RETURN
5220 PRINT "YOU DISTURBED A MONSTER I
N(8 SPACES)HIS CHAMBER":
5230 GOSUB 860
5240 PRINT "AND HE SPEAKS . . . . .
. ":
5250 GOSUB 860
5260 RETURN
5270 GOSUB 5180
5280 GOTO 2040
5290 IF CA=CB THEN 5170
5300 RETURN
5310 G=100
5320 GOSUB 860
5330 PRINT
5340 PRINT "YOU . . . . . DROPPED":
5350 PRINT "MOST OF YOUR GOLD PIECES.
":
5360 PRINT "YOU HAVE . . ";G;" GOLD
(5 SPACES)PIECES LEFT.":
5370 RETURN
5380 REM
5390 RETURN
5400 PRINT "THE DOOR CLOSES AND LOCKS
(3 SPACES)BEHIND YOU":
5410 CALL SOUND(1000,8207,30,8803,30,
500,30,-8,5)
5420 GOSUB 860
5430 RETURN
5440 PRINT "YOU OPEN A SECRET DOOR AN
D ":
5450 CALL SOUND(1000,8207,30,8803,30,
500,30,-8,5)
5460 GOSUB 860
5470 RETURN

```

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64 Mosaic Puzzle

Bruce Jordan

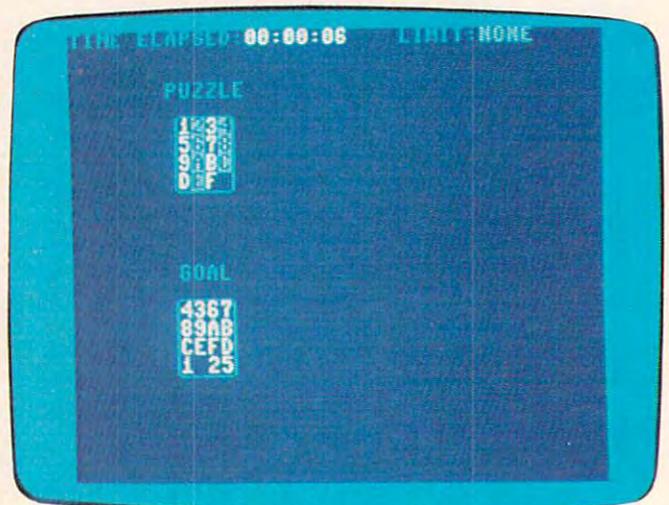
Translation by Chris Metcalf, Programming Assistant

In our October issue, we published a game, "Mosaic Puzzle," with versions for several computers. Program 2, which was identified as the 64 version, actually runs on the VIC. Here is the 64 version.

"Mosaic Puzzle" is a computer version of those sliding-squares puzzles that used to drive people nuts before the advent of Rubik's Cube. The object of the game is to arrange the 15 squares (1 - 8 and A - F) into some predetermined order by sliding them around in their frame. The first few moves are easy, but as the game progresses, it gets a lot more complicated. You'll find yourself rearranging everything just to get the last few squares in place.

When you start the game, you're asked if you wish to set a time limit. If you answer Y for yes, enter the time limit in one line with no spaces or punctuation between the values. For example, for a 1-hour, 23-minute limit, enter 012300. If no time limit is selected, the screen will display elapsed time and TIME LIMIT: NONE.

Next, enter the goal order that you will try to match to win the game. Note that some goals cannot be reached from the given starting arrangement. If you reach a point where only two adjacent tiles must be switched to complete the puzzle, then your goal is unreachable. You can also select various keys for up, down, left, and right movement. If you prefer a joystick, use port two. When you are playing, pressing the RETURN key or the fire button allows you to pause momentarily before resuming the game, restarting the program, or stopping entirely. Breaking off and resuming has no effect on the time clock (displayed at the top of the screen along with the time limit).



64 Mosaic Puzzle

```
100 POKE53280,14:POKE53281,6:POKE55,176:P
   OKE56,29:CLR:POKE54276,8:POKE54283,8
110 POKE54277,0:POKE54278,255:POKE54284,0
   :POKE54285,255:POKE54296,15
120 S=1355:SC=S+54272:DIMA$(16)
130 PRINT"{CLR}":G=1632:X=0:DX=1:P=55904:
   S1=54276:S2=54283:AD=1232:R=14
140 PRINT"{CLR}{DOWN}"TAB(11)"HEX NUMBER
   {SPACE}PUZZLE"TAB(51)"[17 Y]{DOWN}"
150 :
160 :
170 REM FIND TIME LIMIT, MOVE KEYS
180 PRINT"[7] DO YOU WANT A TIME LIMIT?
   "":GOSUB270
190 IFIN$<>"Y"THEN240
200 H=1:INPUT"{HOME}{6 DOWN} HOURS MINS S
   ECS (6 DIGITS)":T$:IFLEN(T$)<>6THEN20
   0
210 IFLEFT$(T$,2)>"23"ORLEFT$(T$,2)<"0"TH
   EN200
220 IFMID$(T$,3,2)>"59"ORMID$(T$,3,2)<"0"
   THEN200
```

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```

230 IFRIGHT$(T$,2)>"59"ORRIGHT$(T$,2)<"0"
    THEN200
240 PRINT"{DOWN} KEY FOR UP: ";:GOSUB270:
    U$=IN$:PRINT"{DOWN} FOR DOWN: ";:GOSU
    B270:D$=IN$
250 PRINT"{DOWN} FOR LEFT: ";:GOSUB270:L$
    =IN$:PRINT"{DOWN} FOR RIGHT: ";:GOSUB
    270:R$=IN$
260 GOTO310
270 PRINT"[+]";:WAIT198,255:GETIN$:PRIN
    T"{LEFT}";:POKE216,1:PRINTIN$:RETURN
280 :
290 :
300 REM FIND GOAL ORDER
310 PRINT"{CLR}"TAB(43)"ENTER GOAL SETUP"
320 PRINT"{DOWN}{3 SPACES}1 2 3 4 5 6 7 8
    9"SPC(23)"A B C D E F {RVS}SPACE"
330 PRINTTAB(5)"{DOWN}IN ANY ORDER":PRINT
    TAB(248)"GOAL
340 FORK=0TO3:POKE1592+K,100:POKE1792+K,9
    9:POKE55864+K,R:POKE56064+K,R
350 POKE1631+K*40,103:POKE1636+K*40,101:P
    OKE55903+K*40,R:POKE55908+K*40,R:NEXT
360 FORI=1TO16:POKEG+X,63:POKEP+X,1
370 WAIT198,255:GETA$(I):FORL=I-1TO0STEP-
    1:IFA$(I)=A$(L)THEN370
380 NEXT:IFA$(I)=" "THENFORK=0TO4:POKE554
    71+K,15:NEXT:B2=32:GOTO420
390 IF(A$(I)<"1"ORAS$(I)>"F")OR(A$(I)>"9"A
    NDA$(I)<"A")THEN370
400 B=VAL(A$(I)):B2=B+48:IFBTHENPOKE55417
    +2*B,15:GOTO420
410 B=ASC(A$(I))-64:B2=B:POKE55457+2*B,15
420 POKEG+X,B2:X=X+DX:IFX=4THENG=G+40:P=P
    +40:X=0
430 NEXT
440 :
450 :
460 REM SET UP WORK AREA
470 PRINT"{HOME}":FORI=0TO64:PRINT"
    {4 SPACES}";:NEXT:PRINT"{HOME}"TAB(12
    7)"PUZZLE"
480 FORK=0TO3:POKE1192+K,100:POKE55464+K,
    R:POKE1392+K,99:POKE55664+K,R
490 POKE1231+K*40,103:POKE55503+K*40,R:PO
    KE1236+K*40,101:POKE55508+K*40,R:NEXT
500 READA,B,C:IFA>0THENPOKEAD+A,B:POKE55
    504+A,C:GOTO500
510 FORI=1TO500:NEXT:POKES1-3,80:POKES1,3
    3:PRINT"{HOME}"TAB(28)"{10 DOWN}{RED}
    {WHT}!GO!{7}"
520 FORT=1TO300:NEXT:PRINT"{HOME}"TAB(28)
    "{10 DOWN}{4 SPACES}":POKES1,8:TI$="0
    00000"
530 PRINT"{HOME}"TAB(25)"LIMIT:{CYN}";:IF
    T$=""THENPRINT"NONE":GOTO580
540 PRINTLEFT$(T$,2)": "MID$(T$,3,2)": "RIG
    HT$(T$,2)"{7}"
550 :
560 :
570 REM LOOP MAIN CONTROL
580 PRINT"{HOME}TIME ELAPSED:{WHT}"LEFT$(
    TI$,2)": "MID$(TI$,3,2)": "RIGHT$(TI$,2
    )" {7}"
590 IFH=1ANDT$<=TI$THEN750
600 GETB$:J=31-PEEK(56320)AND31:IFB$=""AN
    DJ=0THEN580
610 IFB$=CHR$(13)ORJ=16THENWN=0:GOTO780
620 IFB$=D$OR(JAND2)THENDR=-40:CK=100:GOT

```

```

0660
630 IFB$=L$OR(JAND4)THENDR=1:CK=101:GOTO6
    60
640 IFB$=R$OR(JAND8)THENDR=-1:CK=103:GOTO
    660
650 DR=40:CK=99:IFB$<>U$AND(JAND1)=0THEN5
    80
660 IFPEEK(S+DR)=CKTHEN580
670 POKES,PEEK(S+DR):POKESC,PEEK(SC+DR):P
    OKES+DR,32:S=S+DR:SC=SC+DR
680 FORM=0TO120STEP40:FORN=0TO3:W=PEEK(AD
    +M+N)AND127:IFW<>PEEK(1632+M+N)THEN58
    0
690 NEXT:NEXT:PRINT"{HOME}"TAB(24)"
    {5 DOWN}{CYN}{RVS}YOU WIN!{7}":POKE
    S1-3,0:POKES1,33:WN=1
700 READN1,N2,D:IFN1=-1THENPOKES1,8:GOTO7
    80
710 POKES1-4,N1:POKES1-3,N2:FORT=1TOD:NEX
    T:GOTO700
720 :
730 :
740 REM END OF GAME
750 PRINT"{HOME}"TAB(23)"{5 DOWN}{WHT}
    {RVS}!YOU LOSE!{7}":POKES1-3,10:POK
    ES1,17:WN=1
760 POKES2-3,60:POKES2,129:FORT=1TO300:NE
    XT:POKES2,8:POKES1,8
770 :
780 TM$=TI$:PRINT"{HOME}"TAB(21)"{9 DOWN}
    (1) RESET
790 PRINTTAB(21)"{DOWN}(2) QUIT":IFWN=0TH
    ENPRINTTAB(21)"{DOWN}(3) AS YOU LEFT
    {SPACE}IT"
800 GETV$:IFV$<"1"ORV$>"3"THEN800
810 IFV$="1"THENRUN
820 IFV$="2"THENEND
830 IFWNTHEN800
840 PRINT"{HOME}{8 DOWN}":FORI=1TO6:PRINT
    TAB(21)"{18 SPACES}":NEXT
850 TI$=TM$:GOTO580
860 :
870 :
880 REM SETUP AND MUSIC DATA
890 DATA0,49,1,1,178,3,2,51,1,3,180,3
900 DATA40,53,1,41,182,3,42,55,1,43
910 DATA184,3,80,57,1,81,129,3,82,2,1
920 DATA83,131,3,120,4,1,121,133,3,122
930 DATA6,1,123,32,3,-1,-1,-1
940 DATA 96,22,150,0,0,50,96,22,75,0,0,50
    ,96,22,75,49,28,175,96,22,115,49,28
950 DATA175,135,33,250,0,0,0,-1,-1,-1 ©

```

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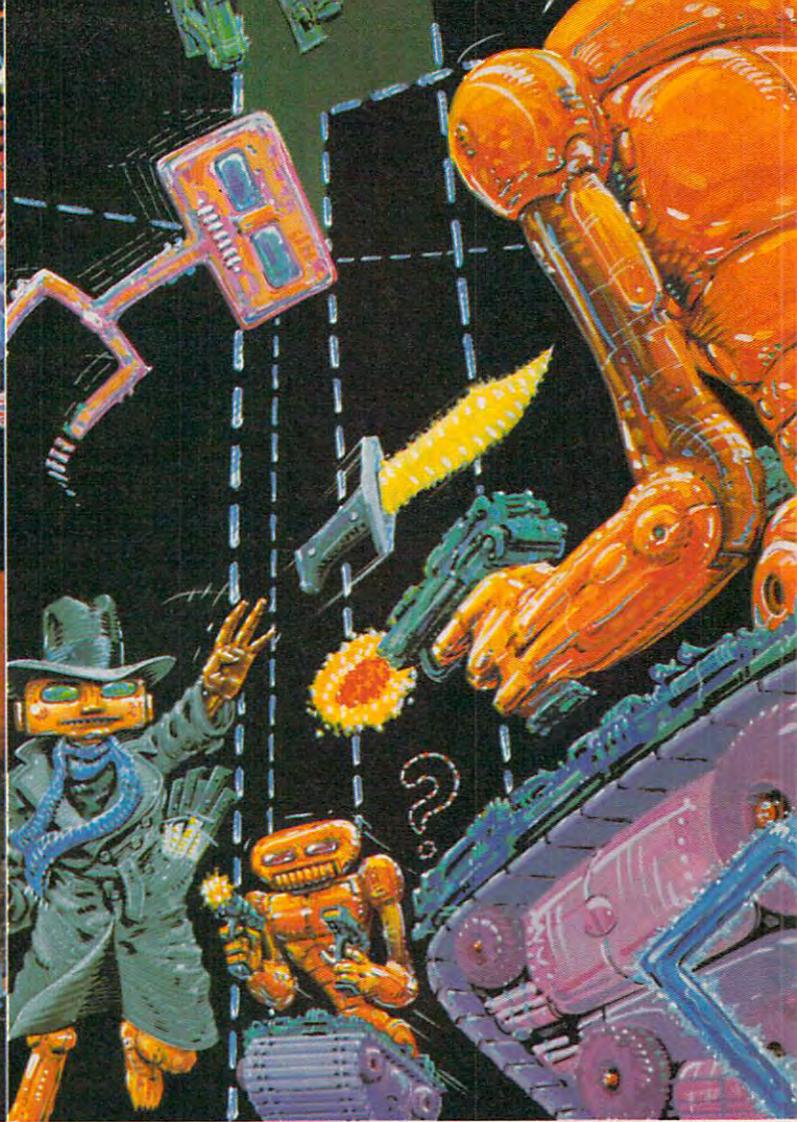
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Winnie The Pooh's Alphabet Adventures

Fred D'Ignazio, Associate Editor



One afternoon while Eric was riding his Big Wheel bike on the sidewalk in front of his house, a brown UPS truck pulled up, and a man hopped out and put some giant boxes on Eric's front porch. Eric went

and got his dad. His dad told him that inside the boxes was a new NEC Trek home computer that had been sent, on loan, from the NEC Home Electronics Company in Elk Grove Village, Illinois.

They set the computer up in Eric's bedroom. He liked the computer. It was neat to look at, with its ivory case, and its gray and orange keys. It was easy to use, too. He used its Micro Painter program to make pictures and its Electric Pencil program to do lots of gobbledygook processing.

The NEC Trek was special, too, because it had games with all of Eric's favorite Walt Disney characters. He wanted to play the games and see Mickey Mouse, Donald Duck, Cinderella, the 101 Dalmations, and Winnie the Pooh. But, so far, he still hadn't played any of the games.

His dad had lots of excuses to explain why

the games weren't ready. He mumbled something about RAMs and ROMs and an extended BASIC cartridge that hadn't arrived.

Eric already had a game disk with the word WINNIE written in big letters in blue ink. The disk had a game called Winnie the Pooh's Alphabet Adventures. But his dad told him that they still didn't have a disk drive to put the disk into.

He really wanted to see the Winnie the Pooh program, so he put pressure on his dad to get his act together and find the equipment they needed to make the program work.

Pretty soon, more big brown boxes started arriving in the mail. Eric loved opening boxes. He had never run into a box he couldn't open. When he was only six months old, his parents put a box around him, with holes for his head, legs, and arms. On the side of the box his dad drew, in big letters, the words PAPER SHREDDER. And he drew lots of pretend dials and switches. It was Eric's first Halloween costume. He went to three

Fred D'Ignazio is a computer enthusiast and author of several books on computers for young people. His books include Katie and the Computer (Creative Computing), Chip Mitchell: The Case of the Stolen Computer Brains (Dutton/Lodestar), The Star Wars Question and Answer Book About Computers (Random House), and How To Get Intimate With Your Computer (A 10-Step Plan To Conquer Computer Anxiety) (McGraw-Hill).

As the father of two young children, Fred has become concerned with introducing the computer to children as a wonderful tool rather than as a forbidding electronic device. His column appears monthly in COMPUTE!.



The first frame of Winnie the Pooh's Alphabet Adventures game is on the display screen. Next to the NEC Trek computer are several other games produced by the Walt Disney Educational Media Company.

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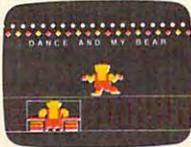


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*Software included with Touch Tablet varies with computer type.

Halloween parties, crawled around on the floor, and shredded any paper that he found in his path.

But Eric wasn't a baby any longer. He was four years old, and he could shred boxes the way he used to shred paper. When the computer boxes arrived, he opened all of them with his bare hands. Inside the boxes were the computer parts his dad had told him about. He helped his dad attach all the parts to the main computer that was sitting on a little table in Eric's bedroom.

Run, Winnie, Run!

Finally a box came with the last part. Eric huffed and puffed and "Hulked" open the box. Then he and his dad raced to his bedroom to put the missing part into the computer.

His dad turned on the power. The computer worked! Eric hopped around the room. He almost fell on the computer, he was so excited.

His dad let him put the Winnie the Pooh disk into the disk drive. He let Eric do everything on the computer all by himself. While he was working on the computer, sometimes he saw his dad put his hands over his eyes. Sometimes he saw him grit his teeth and look like he was going to cry. Sometimes he even heard him growl. But he always let Eric do everything. Because of this, Eric was getting pretty good at computers, even though he was only four years old.

His dad read from the NEC manual for the *Alphabet Soup* package. Eventually there would be two programs in the package: the Winnie the Pooh alphabet game and another game called Mickey's Lucky Stars. Mickey's Lucky Stars would teach Eric how to match small letters in the alphabet with big letters; and help him learn which letters come before other letters and which ones come after.

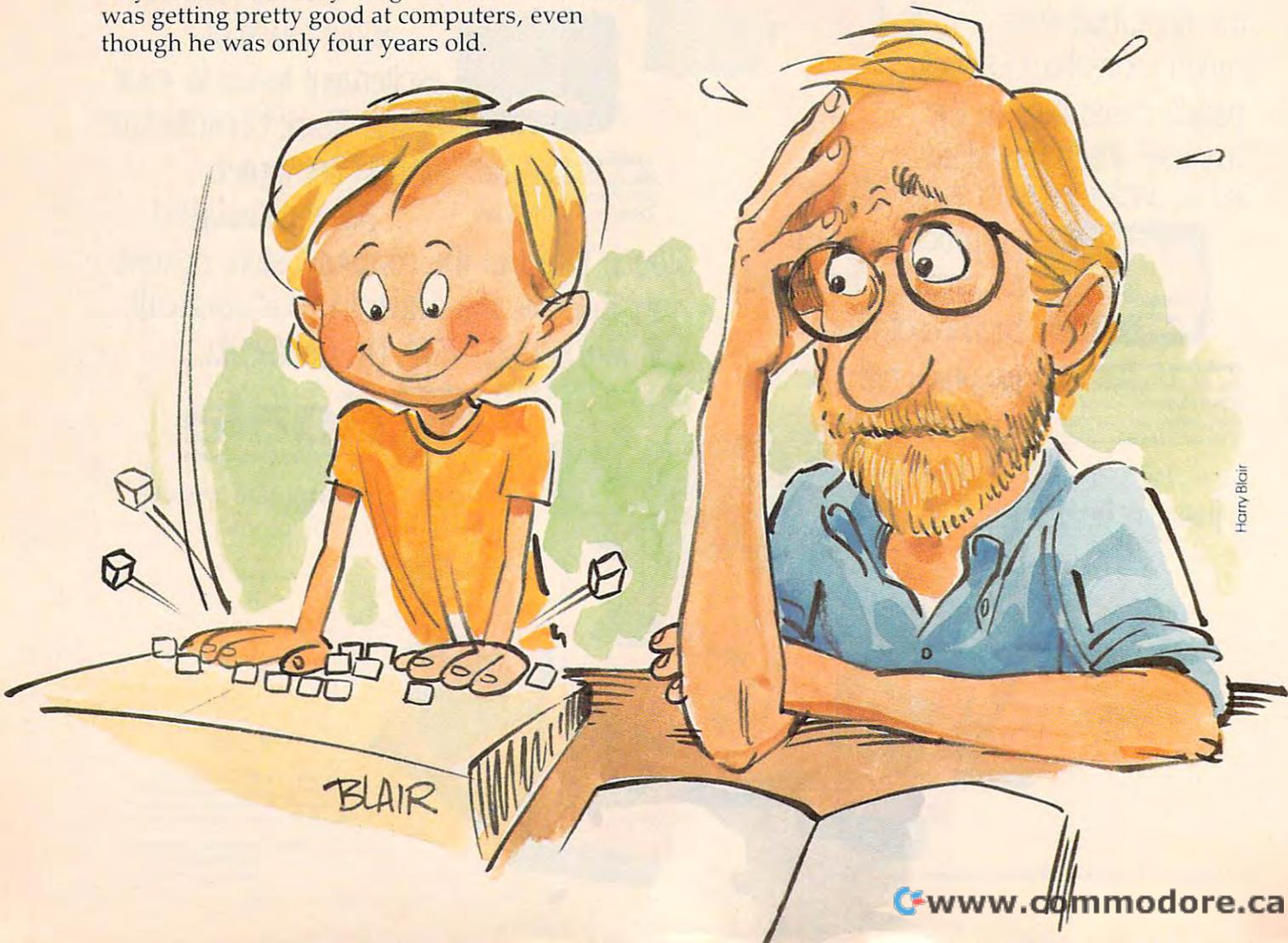
Eric's dad read the commands from the manual. He repeated the letters, one by one, and Eric typed them into the computer. When he was done, the command RUN "winnie." was on the screen. He pressed the RETURN button to send the command to the computer.

Out of the computer's speaker came the song "Winnie the Pooh," and the Pooh bear himself appeared on the screen. Beside him was a big, yellow, blinking question mark.

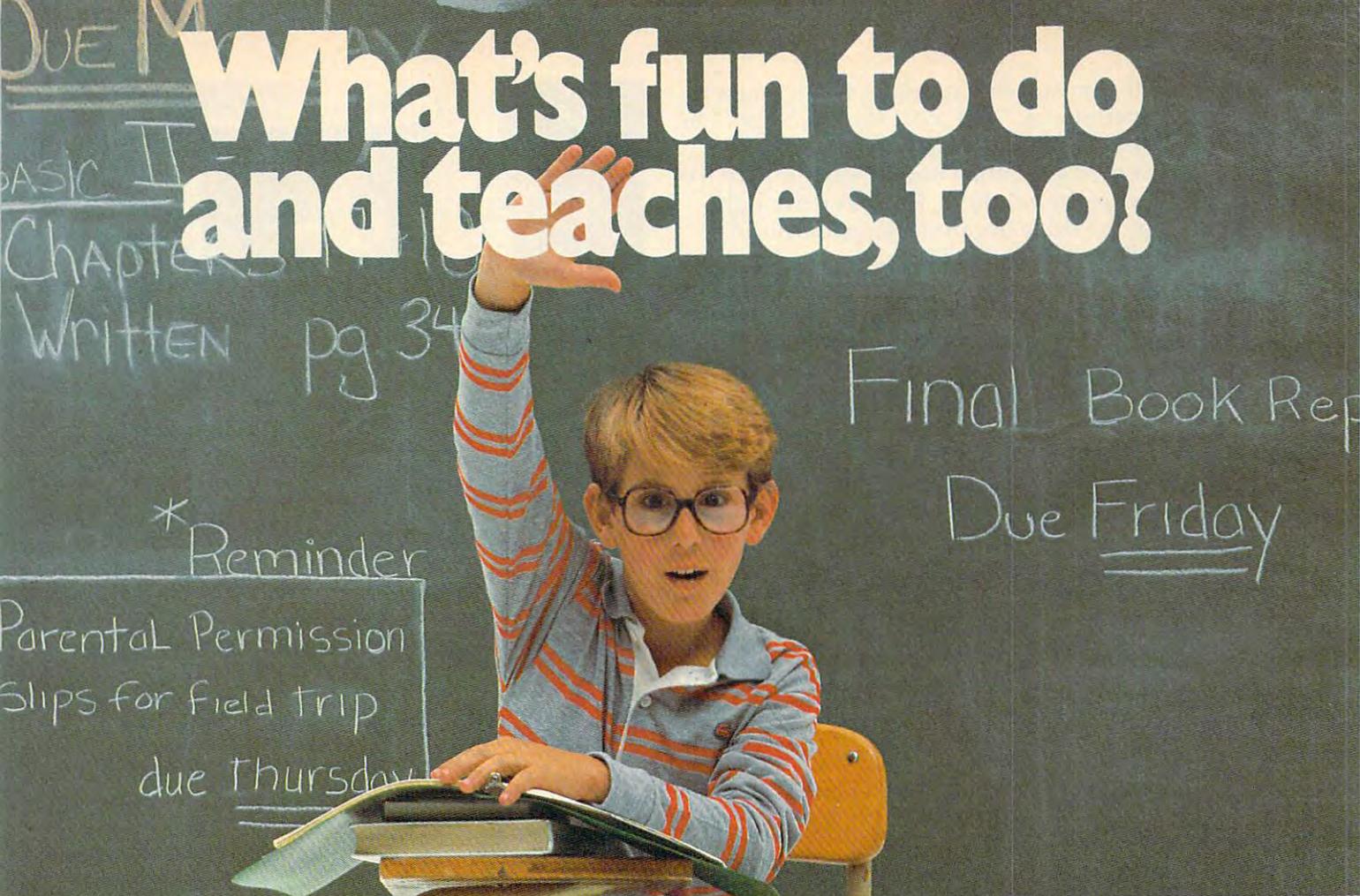
Just then the telephone rang, and Eric's dad took off. "I'll be right back!" he called.

"Sure," Eric thought. "In about a million years."

Eric didn't feel like waiting a million years. Besides, he knew what to do next, even without a manual. When he saw a question mark on the



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screen, that meant the computer wanted him to type something in. "But what should I type?" he wondered. He picked his favorite word: ERIC.

He typed an E, then began searching for the R. But before he got there, the disk drive light came on, the drive began clacking like his Big Wheel bike, and Winnie the Pooh vanished from the screen.

A moment later, a new screen appeared. It was divided into several rectangles, each a different color. The Winnie the Pooh character, Tigger, appeared in the upper left-hand corner of the screen. In the upper center portion of the screen, two E's appeared — one uppercase and one lowercase. On the right-hand side of the screen was an elephant. In the lower left-hand corner of the screen was a yellow box. The box was empty.

All these things appeared on the screen, but Eric didn't notice. He was still busy typing his name. He typed an I and a C, then he looked up.

His dad sailed back into the room. He looked at the screen. "Hey, that's great, Eric," he said. "How'd you do it?"

"By typing my name," Eric answered, not sure whether to be proud or puzzled. "It made an E, but it didn't make an R. Or an I. Or a C."

I Know What To Do!

"I wonder what we do, now," his dad said, peering closely at the screen. The NEC company had sent Eric and his dad about ten pounds of computer manuals to assist them on the computer. But the two of them rarely used manuals, especially when they were just getting started. The fun part of running new programs was to see if they could make them work without reading the instructions.

Eric's dad was naturally cautious around computers. He tried to figure out which button might make the program do something.

Eric had a better approach. When he didn't know what to do next, he pressed *all* the buttons.

His strategy worked. After only a few seconds and a couple of dozen buttons, he found one that did something. He pressed the DEL (Delete) key, and the empty yellow rectangle in the lower left-hand corner of the screen turned blue. He pressed the button again and it turned red. Then it turned green. Each time he pressed the button, it turned a new color.

When Eric pressed the E key, the computer played a little more of the Winnie the Pooh song then went back to the picture of Pooh and the big question mark.

"Hey!" Eric said. "E makes a picture. Then E makes the picture go away."

He pressed some more keys. He eventually made it up to the orange function keys on the top of the keyboard. When he pushed the F4 key,



This screen appears after the boy has typed the letter "J." The Winnie the Pooh character is Kanga. When the boy drags on the touch panel (in the lower corner, on the far right), his picture will appear in the box in the lower lefthand corner of the screen.

Winnie the Pooh, Tigger, and Rabbit appeared on the screen and, with musical accompaniment, waved goodbye.

"Oh, terrific!" said Eric's dad, more than a little distracted and disturbed by Eric's shotgun approach to using the computer. "Now you've terminated the program, and we've only gotten to see one letter."

Eric was momentarily stymied. But at the moment he felt like he could do anything — the way he felt when he was rustling up a jellybean, Cheerio, and dry-noodle stew in the kitchen, or tying his shoes, or stirring up Mowie's breakfast of gooey cat food and kibbles. He surveyed the keyboard. Then he was ready. "I know what to do," he said confidently, and began pressing all the keys at the same time.

He got to the F5 key and pressed it. Winnie and his friends disappeared. The title frame came back on. He had restarted the game. He looked up at his dad. "See?" he said.

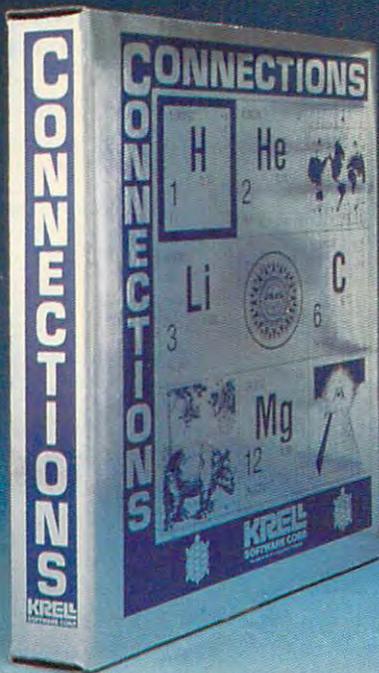
All It Takes Is Teamwork

Eric and his dad worked well as a team. With their combined brainpower and Eric's penchant for button pushing, they soon figured out how to use the rest of the program.

For example, when Eric pressed the F1 button, the NEC thermal printer started making noises like a tire spinning on ice, and paper started creeping out with a copy of the picture on the computer display screen.

Eric loved this part. Printing pictures was so easy! Very quickly, his bedroom floor filled up with 4-inch by 4-inch scraps of paper featuring all the Pooh characters and creatures whose names began with every letter from A to Z.

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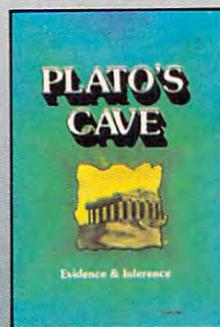
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Solving The Mystery Of The Blank Box

The blank box in the lower left-hand portion of the screen was the greatest challenge. Even when Eric printed out the display screen, the box was empty. Why was it empty? Either the program was broken and the box was supposed to have something in it, or Eric and his dad were supposed to put something in the box themselves.

They tried using the joystick. That didn't work.

They pressed all the keys on the keyboard again. No luck there, either.

They were about ready to give up and peek at the Winnie the Pooh program's instructions. Then they figured it out. They could fill up the box by drawing things on the NEC Trek touch panel, a flat drawing tablet that reproduced a copy of a picture on the computer's display screen.

The touch panel freed Eric from the computer keyboard. And that's when the real fun started!

His dad went into his study and cut up lots of pieces of paper to fit on the touch panel. Two flexible magnetic strips held each piece of paper on the panel so it wouldn't move about.

Eric climbed on the metal truck and, on top of his dresser, found the black felt-tip marker that NEC had supplied with the touch panel.

He began drawing on the panel. He drew circles, triangles, straight lines, and random squiggles. Then, satisfied with his artwork, he pressed the F1 button and printed his picture — complete with a letter of the alphabet (in upper- and lowercase), a picture of an animal whose name began with that letter, and a character from Winnie the Pooh.

Eric then took the pictures he had just drawn and put them onto the touch panel. He created new pictures by tracing the animals and letters on the old pictures. He created drawings that looked reasonably like Winnie the Pooh, skeleton hands, elephants, alligators, and birthday cakes.

For Eric this was a thrill — such a thrill that he drew pictures on the touch pad, picture screen, and thermal paper for another two hours. And the next morning, when he woke up, it was the first thing he wanted to do, even before his all-important bowl of Cheerios.

Drowned In Alphabet Pictures

The night before, after the first hour, little scraps of paper were all over Eric's bedroom. Eric wanted to create a picture for each of his pets (his robot Denby, his puppy, and his kitty), for each member of his family and all his friends. Each picture had the first letter in the name of the person or creature it was going to.

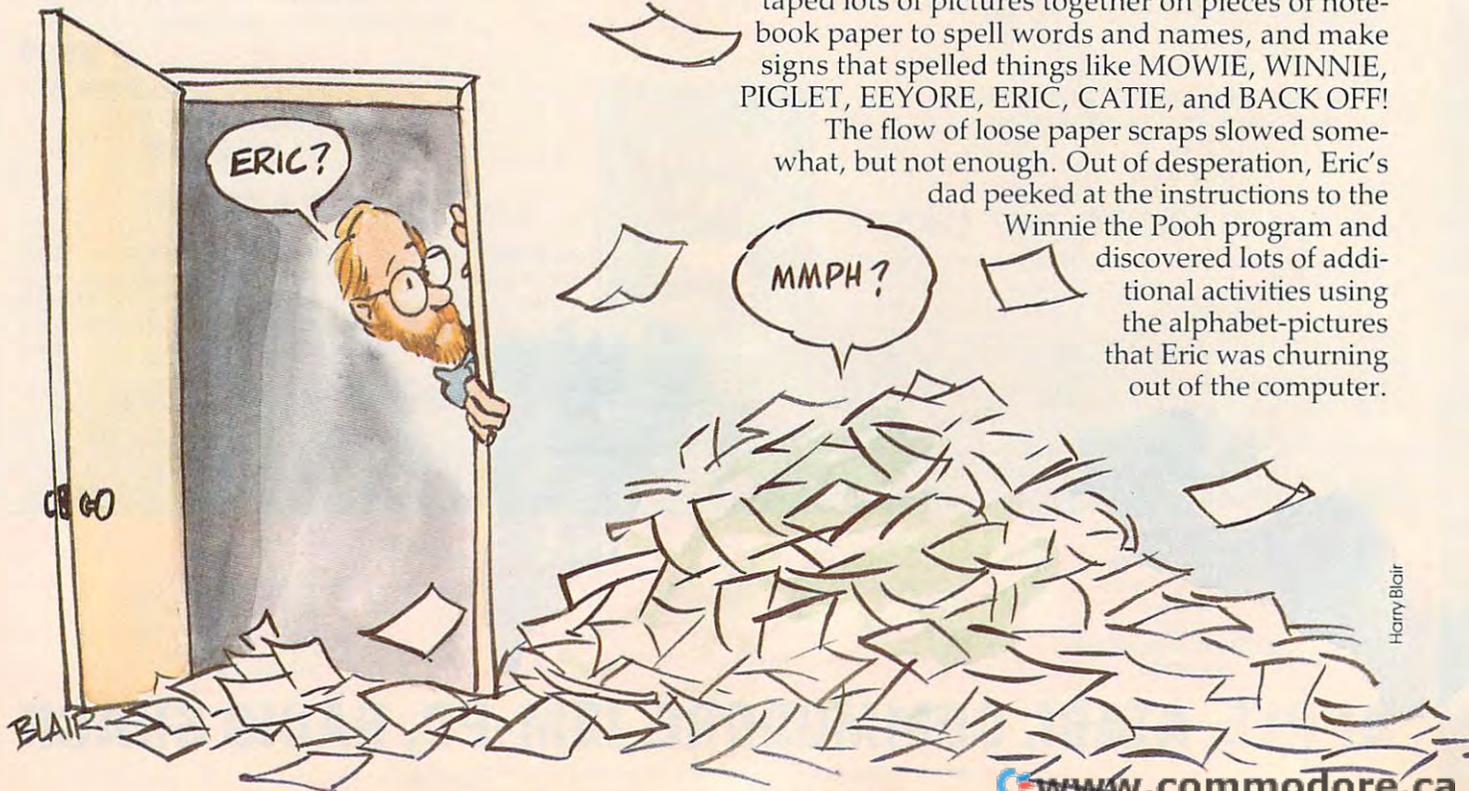
Paper scraps flooded the bedroom, and his dad grew alarmed. He had visions of being drowned by Pooh pictures. He suggested that Eric try to group the papers into piles.

To his dad's relief, Eric came up with the idea to make "books" out of several of the pictures. The letters could be grouped together to make alphabet books, or to form the complete names of his mother, father, sister, grandparents, cousins, and his pets, creatures, and friends.

He and his dad got busy and turned Eric's bedroom into a miniature printing company. They stapled the pictures together into books, and they taped lots of pictures together on pieces of notebook paper to spell words and names, and make signs that spelled things like MOWIE, WINNIE, PIGLET, EEYORE, ERIC, CATIE, and BACK OFF!

The flow of loose paper scraps slowed somewhat, but not enough. Out of desperation, Eric's dad peeked at the instructions to the

Winnie the Pooh program and discovered lots of additional activities using the alphabet-pictures that Eric was churning out of the computer.





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by Dennis Zander

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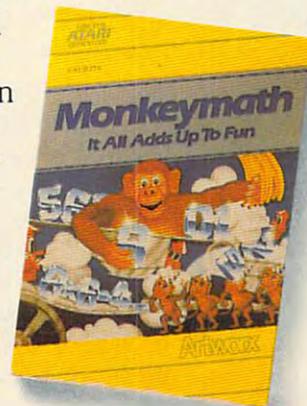
But the part your *child* will like is Monkeymath's arcade-type action and animation, three skill levels and scoring. So, like any good arcade game, kids just can't stop playing it.

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Buying A Ticket To The Magic Kingdom

Walt Disney software runs on the NEC Trek computer (also known as the PC-6001A). Here are the prices of the components of a minimal NEC Trek system that will take full advantage of the software's features:

NEC Trek Computer (PC-6001A)	\$349.95
Disk Unit (PC-6031A)	549.95
Data Recorder (PC-6082A)	99.95
Expansion Unit (PC-6011A)	99.95
Extended BASIC Cartridge	49.95
32K ROM/32K RAM Cartridge	49.95
Touch Panel (PC-6051)	149.95
Thermal Printer (PC-6021A)	249.95

Of course, you will also need a monitor or TV set to run the Walt Disney software.

The NEC Trek is an excellent home computer system. It is attractive, its full-sized keyboard has a nice touch, and the display on computer screen is beautiful: Large white characters are displayed on a rich green background, and helpful function keys are displayed, as a reminder, at the bottom of the screen. The system's components are equally attractive and are reliable, easy to attach, and easy to use.

But do you need all the components above to run the Walt Disney software?

You need most of the components, but not all. The Walt Disney software will be sold on cassette and disk, so you need to buy a data recorder (\$99.95) or a disk unit (\$549.95), but not both. The data recorder is the way to go if you have a tight budget, but I don't recommend it. The Disney software takes up a lot of space in the computer's memory. Loading the programs from cassette will be tedious and time-consuming — not the way to get started on a fun learning activity with your child.

In addition, you do not need the touch panel (\$149.95) or the thermal printer (\$249.95) to make the software run. However, if you elect to go this low-budget route, I think that you'd be better off (in the case of "Winnie the Pooh's Alphabet Adventures") with an inexpensive alphabet book for your child. The touch panel and the thermal printer are the keys to making the software

interactive and a joyous experience for a young child (see my accompanying review with my four-year-old son Eric). Young children can use the touch panel and the thermal printer and create *their own* alphabet books.

Winnie the Pooh's Alphabet Adventures will be part of a two-program package entitled *Alphabet Soup*. The other program will be Mickey's Lucky Stars and will teach letter sequences. *Alphabet Soup* is already available. It is just the first of five Walt Disney software packages. The packages teach the letters in the alphabet, reading, writing, spelling, and arithmetic. They will also help develop a child's problem-solving, logic, and fine motor abilities. Each package will cost \$34.95 (disk or cassette).

I will review the forthcoming Disney packages in future issues of COMPUTE!. The reviews will appear about the time that each package is released. Here are the titles of all the packages and programs:

Alphabet Soup (Ages 3 – 7)

Winnie the Pooh's Alphabet Adventures
Mickey's Lucky Stars

Goblins & Galaxies (Ages 9 – 14)

Minnie and the Haunted Mansion
Goofy in Space

Mathematical Maze Craze (Ages 7 – 12)

Cinderella's 3-D Maze
Mickey's Mathematical Mops

Race To The Arcade (Ages 7 – 14)

Donald's Word Arcade
Dalmation Multiplication

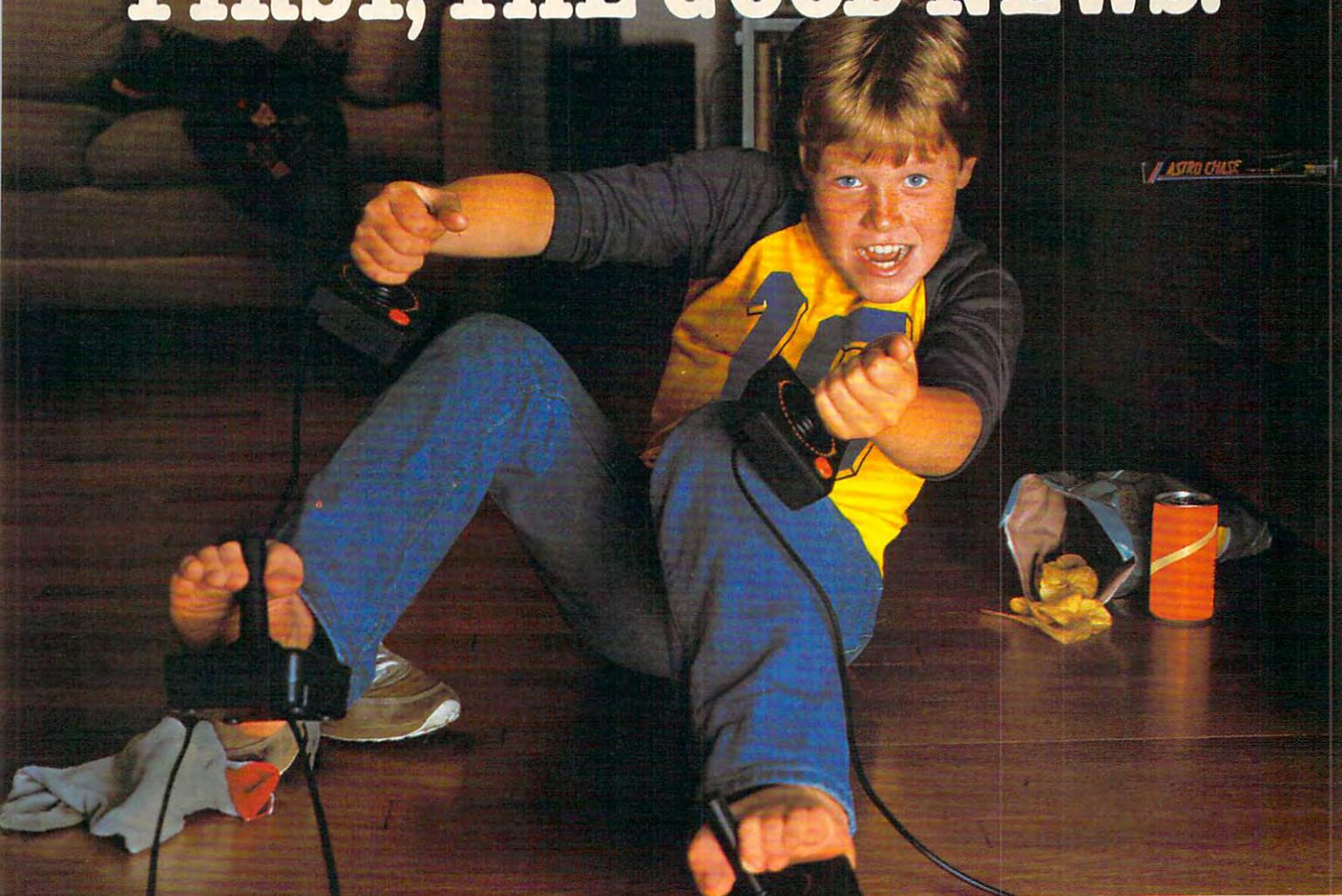
Countdown Carnival (Ages 7 – 10)

Mickey and the Beanstalk
Cinderella's Beads

If you want to learn more about the NEC Trek (PC-6001A) computer and the Walt Disney software, write or call:

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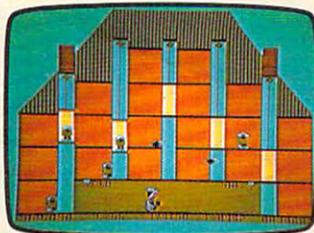


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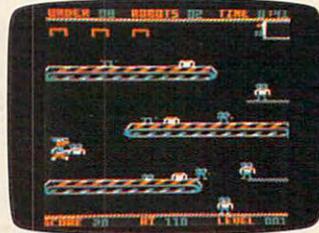
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They began to use the pictures as alphabet flash cards and played lots of games, including Concentration (guess the missing letter), Scrambled Letters (trying to reorganize letters to make up a word), Letter Match (matching up lowercase and uppercase letters), Tasty Letters (matching up flash cards with alphabet cereal letters), Alphabet Clothes Line (taping the letter pictures to a string hanging in the room), Mystery Letters (letting Eric run his fingers along the clothes line, and trying to guess which letter he is pointing to).

The Winnie the Pooh user's guide even had a short BASIC program to type in to create a new game. Eric and his dad typed in the game. It was a Mystery Letter game. It typed a sequence of letters on the computer's display screen, but one letter was missing. Eric had to guess the missing letter. If he got the letter right, his dad let him print the letter out on the computer printer.

Typing With His Toes

The more Eric used the Winnie the Pooh program, the more relaxed and creative he became. In the beginning, he sat stiffly in front of the computer keyboard and picture screen, held the touch panel in his lap, and drew on sheets of paper. But by the end of his first session things had changed drastically. His dad lay on his side, sprawling behind Eric, watching him draw his pictures. Eric decided he wanted to get more comfortable, too, so he climbed up on his dad, using him as a reclining lawn chair. He stopped using the paper and marker to make pictures and, instead, began drawing pictures with his finger on the white, glossy plastic surface of the touch panel. It was like electronic finger painting, and he loved it!

When Eric climbed on his dad the first time, he accidentally kicked the Expansion Panel on the side of the computer. Loaded in the Expansion Panel were a RAM cartridge and the Extended BASIC cartridge needed to run the program. When the Expansion Panel became dislodged, the screen went blank and the program disappeared.

Eric pushed the Expansion Panel back against the computer, but he didn't want to reboot the disk (he'd already done that before), so his dad had to do it. While the program was reloading, Eric did backward somersaults across the bedroom floor.

His dad lay back down. Eric stopped doing his somersaults and climbed onto his dad again. As he was making himself comfortable, he pulled the cord out of the touch panel. His dad saw the cord fall off, but he didn't say anything. Eric spent about a minute making a drawing with his finger before he looked up at the computer's picture screen. The little picture box was still empty.

Eric pushed all sorts of buttons on the computer before he realized that nothing was hap-

pening because the touch panel was no longer connected to the computer. This prompted his dad to deliver a little lesson on computer cables as "highways" for the computer's information to zoom back and forth from the computer to peripherals like the touch panel and the printer.

Eric and his dad also discussed the pins on the ends of the cables, so that Eric would know the proper way to plug the cables into the computer and the other equipment.

Eric got the touch panel hooked up. He climbed back up on his dad, dug his elbow into his dad's rib cage, and began drawing. But now the touch panel was upside down. This appealed to him. Everything he did on the touch panel showed up backwards and upside down on the picture screen.

He tried typing the letters in his name. He tried making numbers. He made faces, houses, and robots. Everything appeared on the screen backwards and upside down.

Eric turned the touch panel on its right side and drew pictures. Then he turned the panel on the left side. Then he turned the touch panel over and tried to draw pictures on its bottom. When he found that this didn't work, he improvised by drawing a picture with his knee.

When he was done drawing, he said, "Daddy, please press the print button."

"Phooey!" his dad said. "You're lying on me. How am I supposed to press the button?"

"Please, Daddy?"

When his dad heard that "Please, Daddy?" he couldn't resist. "I'll see what I can do," he said. He looked down at the computer. His bare, sockless foot was only a couple of inches to the left of the keyboard. He lifted his leg carefully (so as not to dislodge Eric and his touch panel) and stretched his big toe toward the F1 button on the keyboard. He missed. The computer made haunted house music to show that he had pressed the wrong key.

He tried again. This time his toe hit the right button. The printer started chugging away and printed Eric's picture.

"Wow!" Eric said, impressed by his dad's display of pedal dexterity. Unfortunately, this gave Eric ideas. It opened his eyes to new ways to interact with computers. He knew that using his fingers was OK, and his sister had once operated her computer using her tongue. But he had never considered using his toes. Until now.

The rest of the evening Eric practiced pressing all the buttons on the NEC Trek with his toes.

He did pretty well, too. And his dad let him do it. But his dad created one rule that Eric had to obey. Before he could continue using the computer, he had to submit to a thorough sponge bath of both feet.

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Learning With Computers

Glenn M. Kleiman

Are you interested in learning the Logo language? Or have you already begun using Logo or teaching it to others? If so, have you or your students encountered any confusion that was frustrating and delayed progress? Would you like more guidance in understanding and explaining what you have heard called the "powerful ideas" inherent in Logo? Do you want to go beyond simple turtle graphics commands and explore more complex procedures, recursion, and language processing? Would you like suggestions from a Logo expert who is also an experienced teacher of the language? If you have answered yes to any of these questions, then I recommend that you get a copy of *Learning with Logo* by Daniel Watt (McGraw-Hill, 1983, \$19.95).

I have used the version of this book designed for MIT (that is, Terrapin or Krell) Logo for the Apple Computer. It contains an appendix explaining differences between MIT Logo, Apple Logo, and TI Logo. Another version of the book is available specifically for users of Apple Logo. Versions for Atari Logo and Commodore 64 Logo are forthcoming.

Learning with Logo is designed to be used with a preprogrammed disk. The disk contains "tool" procedures that can be used as if they were built-in Logo commands. These procedures support many of the lessons in the book. The disk also contains longer programming examples so you can explore them without first typing them. You can order a copy of the disk for Apple, MIT, or TI Logo. The cost is \$15.95, and the author gives permission to make a copy of the disk for anyone else who has purchased the book. All the procedures on the disk are given in an appendix of the book, so you can also type and save them on a disk yourself.

A Wealth Of Information

Learning with Logo is 365 pages long, divided into an introduction, 14 chapters, 4 appendices, and an index. Each chapter begins with a list of the commands and procedures introduced in that chapter, and then gives explanations and examples of how they can be used. The book is well illustrated with clever cartoons and pictures of what you should see on the computer screen as you work through the examples.

Chapter 1 gets you started with Logo. It explains how to load Logo into the computer, use

the keyboard, and enter commands. It also introduces the turtle and the FORWARD, BACKWARD, LEFT, and RIGHT commands. Chapter 2 covers the remaining turtle graphics commands.

Chapter 3 contains two special turtle activities called Shoot and Quickdraw. They are ready to load and use. How they are programmed is discussed later in more advanced chapters.

Shoot is a simple game. The computer draws a target in a randomly selected position on the screen and places the turtle elsewhere. The player uses LEFT and RIGHT commands to turn the turtle directly toward the target and then specifies how far forward the turtle should move to reach the target. This game is designed to help children learn to estimate angles and distances.

Quickdraw is a simple drawing tool. There are six simple commands: F moves the turtle forward 20 steps; B moves it backward 20 steps; R turns the turtle 30 degrees to the right; L turns it 30 degrees to the left; E ends the drawing and lets you give the picture a name; and RD followed by a name of one of your pictures tells the computer to redraw it. Quickdraw is usable by young children and introduces some of the major concepts of Logo, including building complex shapes out of simple building blocks.

Chapter 4 explains how you can teach the computer new Logo procedures. It also explains how to use the Logo screen editor and how to save procedures on a disk.

Chapters 5 and 6 further elaborate the use of turtle graphics commands and procedures. It presents sample projects in which Logo procedures are used to create designs and pictures.

Chapter 7 introduces the important concept of variables. It also covers some of the ways procedures can be programmed to interact and exchange information. This includes an explanation of recursive procedures.

Chapter 8 further explores the concepts introduced in Chapter 7. It explains a procedure called POLY, which is used to draw polygons. POLY has two variables: SIZE (of a side) and ANGLE (number of degrees). Many different patterns and designs can be created by changing these variables and recursively repeating the POLY procedure.

Chapter 9 introduces the fundamental commands for working with numbers, words, and



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lists. These complete the basics needed to begin working with the four larger projects described in Chapters 10 through 13,

Chapters 10 and 11 explain in detail the programs for the Shoot and Quickdraw activities introduced in Chapter 3. The project in Chapter 12 is a race-track game which shows how simple animations can be created. The final project, described in Chapter 13, uses the list-processing commands for working with language. The program has the computer randomly select words from different sets and combine them into sentences and "poems."

The final chapter explains how the special tool procedures on the disk operate. These include procedures for drawing circles and arcs, determining the distance between the turtle and a specified point, counting the number of letters in a word or words in a list, and several others.

The appendices explain how to create your own disk of the procedures used in the book; discuss the differences among MIT, Apple, and TI Logo; explain the use of disks and files; and present a summary of Logo commands.

As this description of the chapters suggests, the book contains a wealth of information about Logo. The early chapters are suitable for complete beginners while the later ones explain sophisticated programming techniques. The book goes well beyond turtle graphics to explain how Logo can be used with numbers, words, and lists. The examples and discussions are all clearly and carefully presented. The material is well-sequenced, with the lessons and programs in each chapter building on what was learned in prior chapters. The many illustrations aid both understanding and interest. And I have not yet described what I regard as the best features of this book.

Helpful Cartoon Symbols

Special cartoon symbols mark what the author calls *pitfalls*, *explorations*, *powerful ideas*, and *helper's hints*. Each symbol marks information that goes beyond the description and explanation of Logo to provide additional guidance and insight.

Pitfalls are confusions or difficulties that many people encounter while learning Logo. The pitfall symbol (a turtle which has fallen into a trap) marks explanations that will help you avoid or get out of pitfalls. Some pitfalls are simple reminders for beginners, like putting a space between a FORWARD command and the number of steps the turtle is to move. Others, such as pitfalls in using recursive procedures, are for more advanced users of Logo.

Powerful ideas help you think more clearly and solve problems with the computer more easily. Some of these ideas, such as dividing a complex problem into a series of simpler ones, will also

help you solve problems that do not involve the computer at all. A cartoon symbol of a turtle with a bright idea designates explanations of powerful ideas. These explanations are important for helping learners see the general principles while they work with specific examples.

Explorations are necessary to become proficient with Logo, but most learners need suggestions for things to explore. These are provided throughout the book, marked by a picture of a turtle with a map and spyglass. Many of the explorations are suggestions for modifying and extending programs given in the book.

Helper's hints explain difficult points and pitfalls more fully, suggest learning activities, and give other practical suggestions for teaching. These are marked by a symbol showing two turtles — an older and a younger one — helping each other learn by shining a bright light on the subject. *Helper's hints* can help you learn more about Logo and help you teach others.

Daniel Watt, the author of *Learning with Logo*, is a former researcher with the MIT Logo group and an experienced Logo teacher. The clarity, organization, and special aids in this book reflect both his expertise with the language and his abilities as a teacher. *Learning with Logo* comes closer to bringing a master teacher to your side than any other book I have seen.

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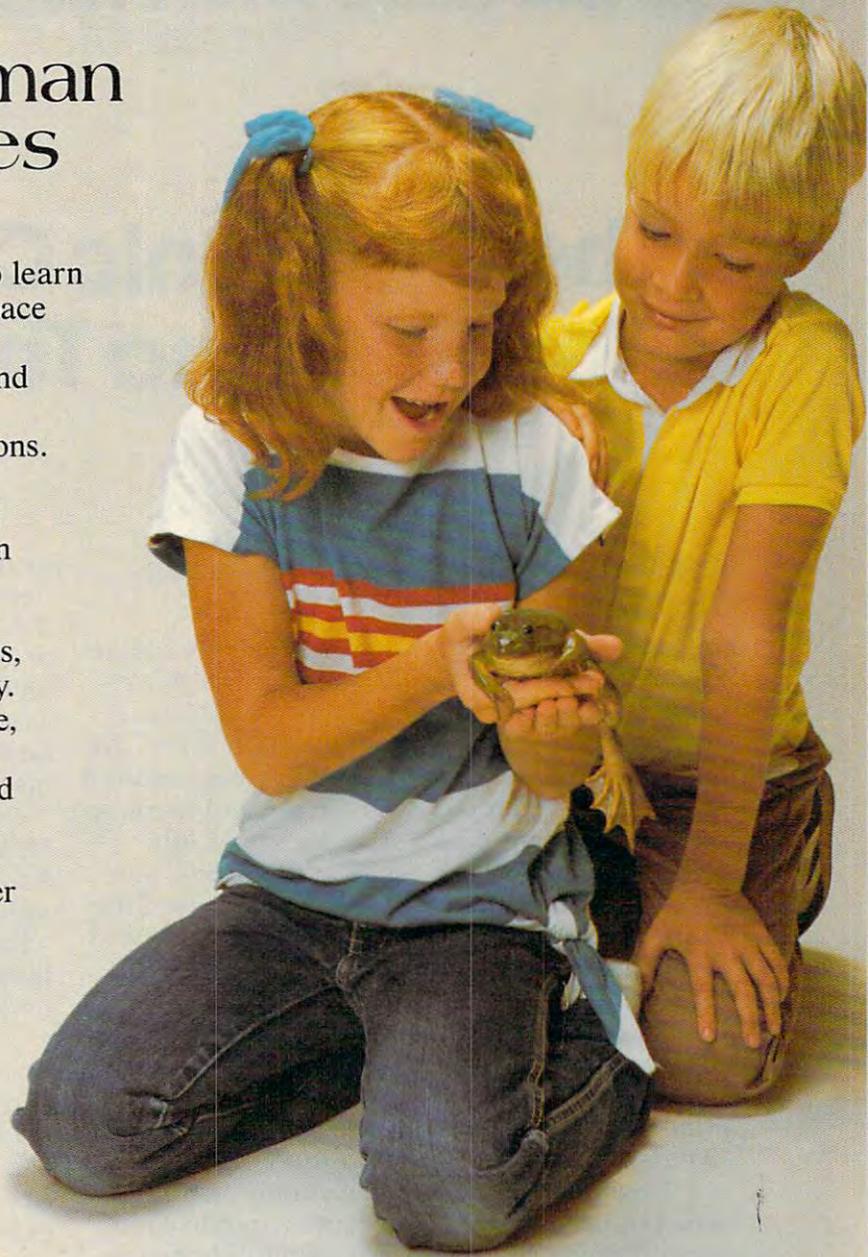
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The Electronic Chalkboards: The BBC And The Powerpad

The Only Computer To Have When You're Having More Than One

Last spring I went to London and taught a course on robotics literacy. According to the *Daily Telegraph*, the classroom where we met was like a "composite of several scenes out of *Dr. Who*." We had robot turtles and robot buggies rolling around on the floor, and robot arms waving and weaving on the tops of our desks. And we had 15 BBC microcomputers linked together in the BBC's Econet local area network. The students used the BBCs to control the robot arms, to learn Logo and BASIC, and to perform experiments with robot sensors.

The 15 BBCs all received their programs from a single disk drive (the *fileserv*) in the front of the classroom. They all used a single printer (the *printserv*) to type out files, programs, and student papers and assignments.

David Barnett, the course's computer instructor, used a BBC as the demonstration computer. David's BBC was connected to a large television set mounted on a shelf so all the students could see it. The computer acted like the course's *electronic chalkboard*. David ran programs on his computer, and they appeared on the big TV. Then he pressed a button, and a copy of his computer's screen appeared on the screens of all the students' computers.

The system was even more flexible than this. The students all worked on individual and team projects. When they finished their projects, they made presentations. To aid their presentations the students could send copies of their screens to all the other students' screens.

And David, in front of the class, could help individual students if they got bogged down in a program. By pressing a couple of buttons on his computer, he could take a snapshot of the screen

on a student's computer. After studying the student's problem, he could take control of the student's keyboard and type in a command or piece of information. The student could watch all this on his or her own screen. A moment later, David would return control to the student, and the student could resume running the program on his own.

This was a tremendous feature. When I am teaching a course and a student asks me a question, I often have to sit down at the student's computer in order to decide what is going on and what to suggest. If you have 15 students, and they are all asking questions, it can get pretty hectic running from computer to computer.

The BBC network eliminates this problem. You can stay seated at your own computer and, with the push of a button, you can "hop" to any student's computer, diagnose his or her problem, and enter the appropriate response. This feature alone, in my opinion, makes the BBC network extremely valuable.

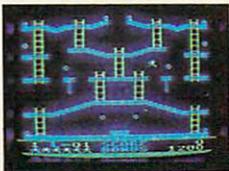
The Only Computer That Majors In Education

Acorn Computers Ltd. sells the BBC computer in England. Its subsidiary, Acorn Computers Corporation, is now selling the BBC in the United States. Acorn can be reached at:

Acorn Computers Corporation
400 Unicorn Park Drive
Woburn, MA 01801
(617) 935-1190

The company is concentrating its efforts exclusively on the \$700 million US education market. Two years ago, the Acorn computer won a contest sponsored by the British Broadcasting Corporation and was given permission to name its computer the BBC. Acorn has since sold BBC computers to 85 percent of British primary and secondary

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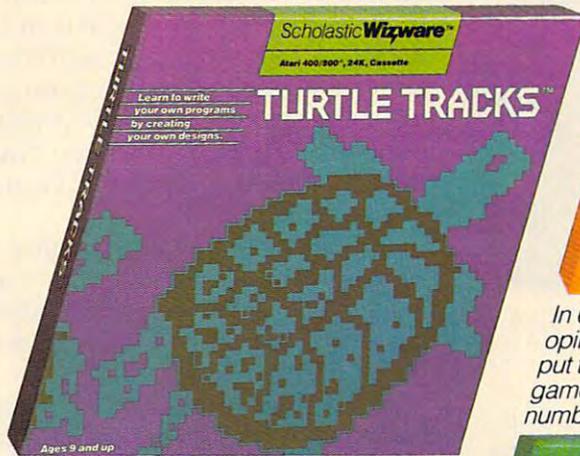
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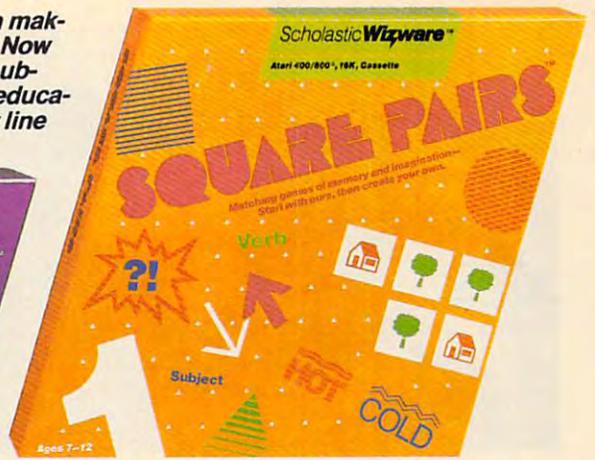
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Microzine™ is an innovation in computer education—a programmed magazine that kids read, "talk" to and help write. It stimulates creativity in children 10 and up.

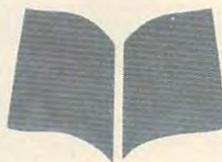


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Scholastic Wizware™ is compatible with Apple®, Atari®, TI-99/4A, VIC-20®, Commodore 64®, and IBM® PC.



Scholastic Wizware™



Five-year-old Jessica Harvey is playing a BBC learning game called Missing Signs.

schools. This amounts to 150,000 computers already installed and 30,000 new computers going out each month.

The US version of the computer is equivalent to the more powerful BBC/B version. For the hefty \$995 price tag, you do *not* get a monitor, a printer, or a disk drive. But you do get 64K RAM/ROM, an additional 80K ROM, built-in BASIC, a (TI) voice synthesizer, built-in word processing, high-resolution graphics (640 x 200 pixels), multi-channel sound, and a software switchable 40- or 80-character screen.

The computer comes with either an RS-423 or Centronics parallel port and with the Econet network interface built-in. The actual network, including software, costs \$595, and enables you to connect up to 254 computers on an inexpensive, four-wire, telephonelike cable. The 6502 processor can be augmented to include an additional 6502 processor, or a Z80, or 32-bit National Semiconductor 16032 processor.

A 440K disk drive costs an additional \$545; an 800K disk drive costs \$995. Acorn offers a monochrome monitor for \$195. The computer will support any of the popular printers, over the serial or parallel ports.

I know from having used the computer in England that the operating system and the computer's version of BASIC are a programmer's delight — extremely powerful yet simple to use. But Acorn's marketing strategy in the US will focus on the software that has been developed for the machine. Two hundred fifty educational packages have already been created for the BBC and approved by Acorn's prestigious nine-member Educational Advisory Board.

In addition, 2,500 software companies produce software for the BBC in England and in Western Europe. Many of these companies are modifying and enhancing their packages so they will meet the board's approval and be available on the US version of the machine.

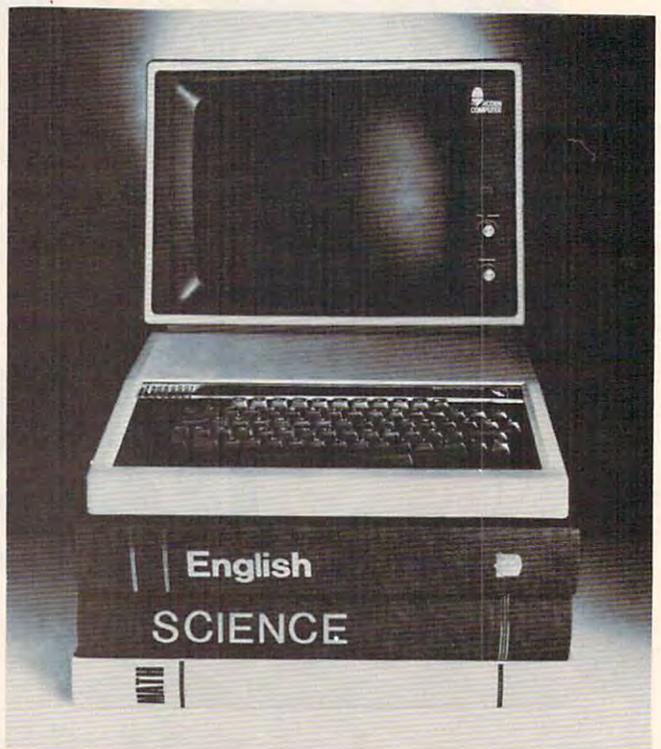
We Give Courses On How To Give Courses

According to Harvey Lawner, general manager and senior vice president of Acorn (US), "Education is our main business. It is not an afterthought." Lawner is critical of computer companies that concentrate on getting a computer into a classroom, but do not provide direct and immediate support. "We aren't just selling a computer," Lawner contends. "We are selling a total learning system."

Lawner's national marketing director, Bob Angelo, contrasts his company's approach with the hardware-first approach adopted by other American companies. "They're selling boxes," he says. "We're selling solutions."

For an educational software package to be approved by the Educational Board, it must be supported by a lesson plan, a student's workbook, a teacher's guide, student notes, and (when appropriate) student experiments. This *print component* forms an integral part of Acorn's effort to turn the computer into a tool that any teacher can use no matter how little experience he or she has had with a computer.

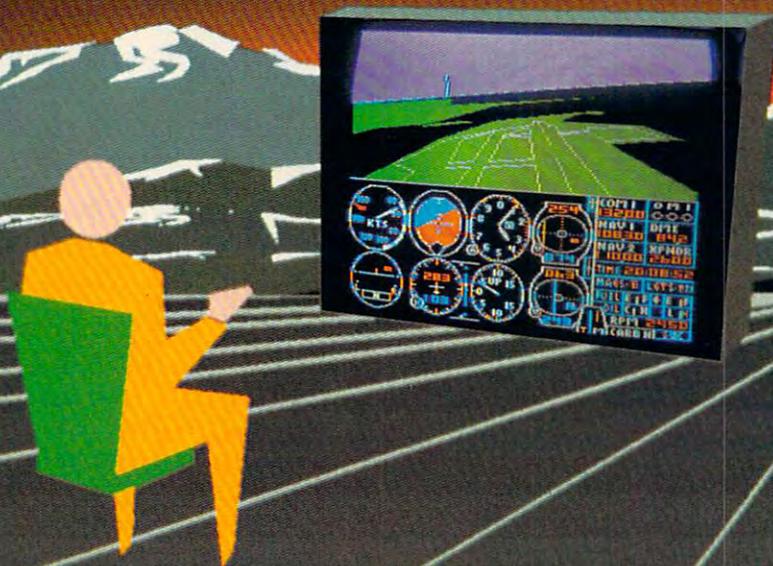
Acorn's philosophy is to package the BBC in a way to make it as familiar as possible to the average teacher. The software, for example, comes in boxes that look like quality, hardcover, linen textbooks.



Acorn Computers Corporation is trying to make the BBC computer look familiar and nonthreatening to teachers. Even the software is packaged to look like classroom textbooks. (Please note: The "books" in this photo are oversized.)

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According to Angelo, Acorn isolated two problems which have inhibited the introduction of microcomputers in the classroom. First, most of the software currently appearing in the classroom is often three to four years old, or even much older. The old software does not reflect the newest philosophies in educational computing and does not make use of the advanced hardware capabilities of the newer microcomputers.

Second, computers in school are being used only by a relatively small number of teachers and students. Most teachers are fearful of the computers and don't see how a computer can make a valuable contribution to their own teaching.

Angelo says that Acorn will attack both these problems head on. First, Acorn is commissioning the development of a huge quantity of new software for use in classrooms on the BBC computer. Second, the Acorn board is helping software companies to translate to the BBC the best new software currently running on other machines.

Chalk Board's PowerPad

Last week I flew to New York and got a chance to preview one of the most exciting new products on the market — the PowerPad, a touch-sensitive tablet in a 20-inch-by-17-inch hard plastic case. The PowerPad plugs into VIC-20, Commodore 64, IBM PC, Apple, and Atari computers.

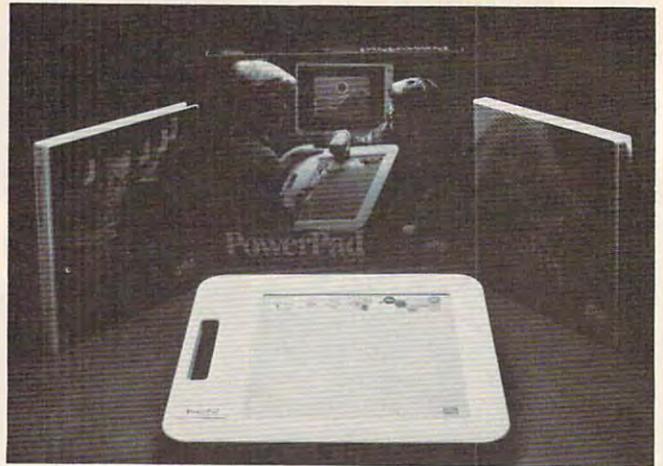
The PowerPad can replace the keyboard as the primary means of inputting information into the computer, especially for children. It has numerous mylar overlays which easily clip on top of the 12-inch-by-12-inch touch-sensitive pad. Each overlay is a new keyboard, a keyboard with colorful shapes and figures.

The PowerPad has only a few "keys" on each overlay, so the child or the beginning user isn't overwhelmed by choices.

The "keys" are large and in bright primary colors. Printed on them are bold words (RED or PLAY) and symbols such as # or *. They are separated by plenty of space to make typing simple.

The PowerPad features a novel design in which signals from the tablet are digitally sensed and encoded. A grid of 14,400 contact points (100 points per square inch) is sandwiched inside the PowerPad. The points can record one contact at a time or a dozen contacts. Older touch pads can sense only one finger at a time. But kids (and adults) can put *all* their fingers on the PowerPad at the same time, and the PowerPad will sense all of them and transmit the proper signals to the computer.

This capability is especially nice with the PowerPad's music software and overlay, *Micro Maestro*. The overlay has a piano keyboard at the bottom and a musical score in the middle, with colorful "buttons" for each note on the score. A



PowerPad with its 12 × 12 inch touch-sensitive surface, and two selections from Leonardo's Library, *MicroMaestro* and Leo's 'Lectric Paintbrush.

child can play a musical chord on the piano keyboard by pressing all three fingers on different keys at the same time. This would be impossible on any other touch pad.

Another software-and-overlay package, *Leo's 'Lectric Paintbrush*, helps a child create colorful pictures on the computer. Again the multicontact feature of the PowerPad becomes especially useful. Before drawing each new part of the picture, the child can press the Pen Up button on the upper left-hand corner of the PowerPad. Immediately a pen tip appears. The child can change the color of the ink being used by pressing one of the colorful paint keys on the upper right-hand corner of the



This family is using the PowerPad with the overlay for Leo's 'Lectric Paintbrush, which allows you to "paint" colorful pictures on the computer screen with your finger. Using the "buttons" at the top, you can create shapes, move them around on the screen, create copies, and then save an entire screen onto tape or disk.

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Robert H. Ranson, President of Chalk Board, showing the PowerPad fitted with the MicroMaestro overlay.

board. When the child picks a new color, the color of the pen tip changes to that color.

Leonardo's Library

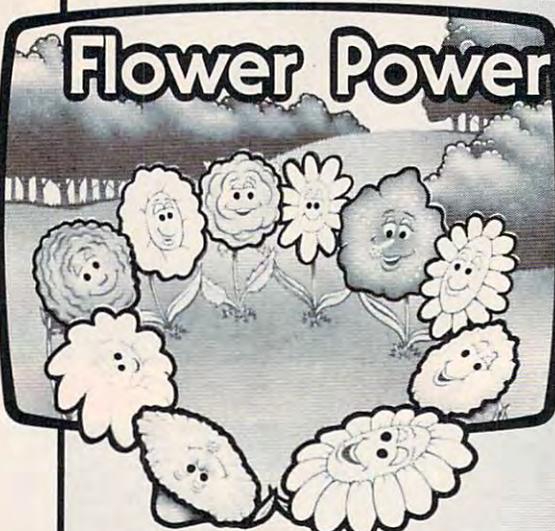
The PowerPad costs \$99.95. It is supported by a large and growing body of educational software, called Leonardo's Library. Programs in the library will cost between \$25 and \$50. The library will include programs focusing on visual arts, music, math, science, language arts, and social studies. Included among the first programs are:

- *Leo's 'Lectric Paintbrush*. An electronic finger-painting kit.
- *Micro Maestro*. Turns the PowerPad into a piano keyboard.
- *Music Math*. Lets children explore the relationships between math and music.
- *Programmer's Kit*. Lets older children and adults write their own software and develop their own creative uses for the PowerPad.

PowerPads and programs in Leonardo's Library are already available at K mart, Apple Computer dealers, and many other computer and discount stores. If you would like to know more about the PowerPad, you can contact Chalk Board directly:

Chalk Board, Inc.
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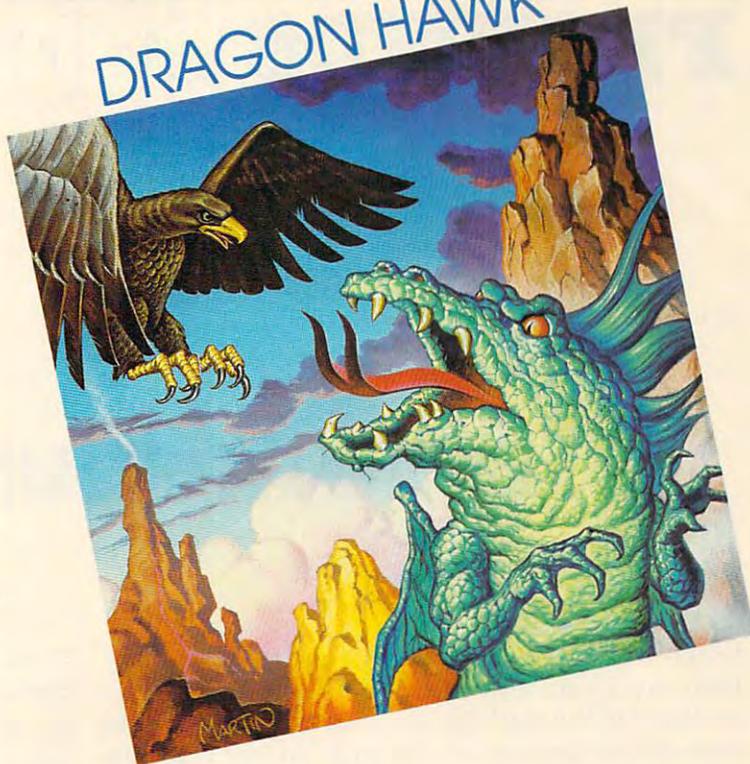
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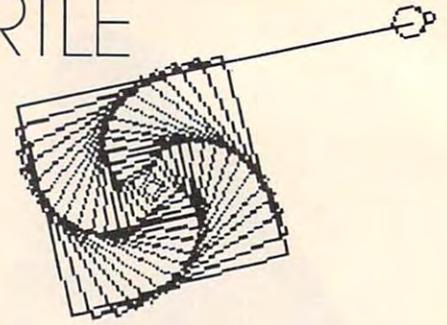
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FRIENDS OF THE TURTLE



David D. Thornburg, Associate Editor

A Turtle Resource Update

When we started "Friends Of The Turtle" in 1982, there were very few turtle graphics languages available in the marketplace, and even fewer books and other resources on this topic. In less than two years, the number of turtle-based activities and resources has exploded. Because many of you may not be able to keep up with all the activity in this area, I thought that it might be a good time to update the turtle resource list.

As hard as I try, I know this list will be quite incomplete. It's almost impossible to be completely up-to-date, so, if you have written a book or language that specifically relates to turtle graphics or to languages such as Logo, and it doesn't appear on this list, please send me a copy for review. I only write about things I have seen with my own eyes — a habit that is essential in this dynamic industry.

Books

There are several books on turtle graphics available today, with new titles available every month or so. Because of the considerable interest in turtle graphics by young computer users, I have labeled each entry with a level. Generally, Level A books are suitable for kindergartners through fourth grade, Level B books are for fifth grade and up, and Level C is for college through adult readers.

H. Abelson, *Logo for the Apple II*, Byte Books/McGraw-Hill, 1982. Level C.

H. Abelson, *Apple Logo*, Byte Books/McGraw-Hill, 1982. Level C.

H. Abelson and A. diSessa, *Turtle Geometry: The Computer as a Medium for Exploring Mathematics*, MIT Press, 1981. Level C.

D. Bearden, *1, 2, 3, My Computer and Me: A Logo Fun Book for Kids*, Reston, 1983. Level A.

D. Bearden, K. Martin, and J. Muller, *The Turtle's Sourcebook*, Reston, 1983. Level A, B, C.

G. G. Bitter and N. R. Watson, *Apple Logo Primer*, Reston, 1983. Level B, C.

J. D. Burnett, *Logo: An Introduction*, Creative Computing Press, 1982. Level A.

P. Coburn et al., *Practical Guide to Computers in Education*, Addison-Wesley, 1982. Level C.

A. Goldberg and D. Robson, *Smalltalk-80: The Language and Its Implementation*, Addison-Wesley, 1983. Level C.

E. P. Goldenberg, *Special Technology for Special Children: Computers to Serve Communication and Autonomy in the Education of Handicapped Children*, University Park Press, 1979. Level C.

P. Kelman et al., *Computers in Teaching Mathematics*, Addison-Wesley, 1983. Level C.

H. Kohl, T. Kahn, and D. Disharoon, *Atari PILOT Activities and Games*, Reston, 1983. Level B.

S. Papert, *Mindstorms: Children, Computers, and Powerful Ideas*, Basic Books, 1980. Level C.

R. P. Taylor, *The Computer in the School: Tutor, Tool, Tutee*, Teacher's College Press, 1980. Level C.

D. D. Thornburg, *Picture This! — An Introduction to Computer Graphics for Kids of All Ages (for Atari PILOT)*, Addison-Wesley, 1982. Level B.

D. D. Thornburg, *Picture This Too! — An Introduction to Computer Graphics for Kids of All Ages (for Apple SuperPILOT)*, Addison-Wesley, 1982. Level B.

D. D. Thornburg, *Computer Art and Animation: A Guide to TI Logo*, Addison-Wesley, 1983. Level B.

D. D. Thornburg, *Computer Art and Animation: A Guide to Radio Shack Color Logo*, Addison-Wesley, 1983. Level B.

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- D. D. Thornburg, *Every Kid's First Book of Robots and Computers*, COMPUTE! Books, 1982. Level A.
- D. D. Thornburg, *Discovering Apple Logo: An Invitation to the Art and Pattern of Nature*, Addison-Wesley, 1983. Level B, C.
- D. Watt, *Learning With Logo*, McGraw-Hill, 1983. Level B.

Computer Languages And Products

In addition to the commercial languages shown here, COMPUTE! has published versions of PILOT to BASIC interpreters that include turtle graphics. These articles started in September 1982 with a version for the Apple by Alan Poole.

Apple computers:

- Apple Logo (disk from Apple)
- Terrapin Logo (disk from Terrapin)
- Krell Logo (disk from Krell)
- Delta Drawing (disk from Spinnaker)

Atari computers:

- Atari PILOT (cartridge from Atari)
- Atari Logo (cartridge from Atari)
- WSFN (disk from Atari APX)
- Delta Drawing (cartridge from Spinnaker)

Commodore computers:

- Commodore 64 Logo (disk from Commodore)
- COMAL (Commodore 64 disk from COMAL User's Group, Len Lindsay, Madison, WI)
- Turtle Graphics II (Commodore 64 cartridge from HES)
- Delta Drawing (cartridge from Spinnaker)

IBM computers:

- Dr. Logo (disk from Digital Research)
- Delta Drawing (disk from Spinnaker)

Radio Shack computers:

- Radio Shack Color Computer (disk or cartridge from Radio Shack)

Texas Instruments computers:

- TI Logo (cartridge from Texas Instruments)

Robots:

- TOPO (remote-controlled robot from Androbot)
- RB-5X (self-contained robot from RB-Robotics)
- Hero-1 (self-contained robot from Heath)

Organizations

The following organizations provide generally nonoverlapping views into the community of users of languages like Logo.

Asociacion Amigos de Logo
Salguero 2969
1425 Buenos Aires, Argentina

Friends of LISP/Logo and Kids (FOLLK)
436 Arbalo Dr.
San Francisco, CA 94132

National Logo Exchange

P.O. Box 5341
Charlottesville, VA 22905

Young People's Logo Association

1208 Hillsdale Dr.
Richardson, TX 75081

A Note About "Friends Of The Turtle"

I have received overwhelming support from you all in the last two years. Together we have seen turtle graphics and the languages that support it move from relative obscurity to the forefront of the personal computer experience. In the beginning there was little to keep track of — and more time to help people on a direct basis. Now the vision we all shared has become reality — high quality turtle graphics environments are available on most of the personal computers on the market today. In keeping with this change, I have decided to focus all my activities for "Friends Of The Turtle" on this monthly column. As always, I want to hear from you with your ideas and programs that you would like shared with your fellow readers. Those of you wishing to join an organization that supports your interest should contact the organizations listed above. Each is excellent and can provide many valuable services to members.

Thank you for a wonderful two years — may the next years be as exciting. ©

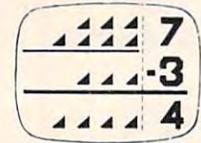
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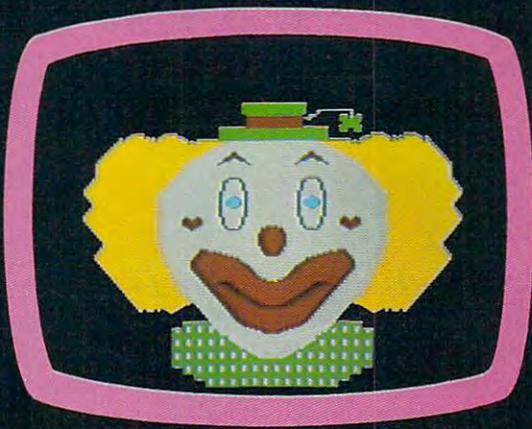
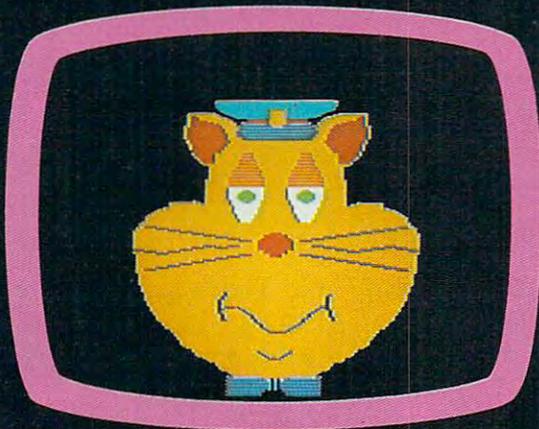
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Questions Beginners Ask

Tom R. Halfhill, Features Editor

Are you thinking about buying a computer for the first time, but don't know much about computers? Or maybe you just purchased a computer and are still a bit baffled. Each month in this column, COMPUTE! will answer some questions commonly asked by beginners.

Q What is the best way to mail computer tapes and disks?

A As carefully as possible. Many tapes and disks arrive at COMPUTE! Publications every month. The vast majority survive the mails unscathed, thanks to careful packing and postal handling. But cracked plastic cassette boxes and crumpled envelopes show that some of them have had a bumpy trip.

Cassettes seem to fare better than disks because of their rigid plastic enclosures. If you need to mail only a few programs, a cassette might be safer. Be sure to use an unbreakable plastic cassette box instead of the standard Philips box.

Disks should always be mailed in the stiff cardboard mailers available at some stationery shops and computer stores.

For either tapes or disks, use a padded envelope if possible, or wrap the media with paper or foam. Plainly mark the envelope with these warnings: "Handle With Care," "Hand Stamp Only," and "Magnetic Media Enclosed — Keep Away From Electric Motors And Other Magnetic Sources." Wrapping the media with aluminum foil offers little or no protection against magnetic fields.

If you find yourself regularly mailing programs to friends, you might want to consider equipping your respective computers with modems and transmitting the programs over the phone. This is also a lot faster and sometimes even cheaper.

Q I am new to home computing. I bought an Atari 800 with a cassette recorder in September. I understand some of the advantages of disk storage versus the cassette, but would like to know some of the disadvantages, if any. I also

don't understand why Atari's 810 disk drive is so expensive (about \$450). Are there disk drives for this machine that are more moderately priced?

A There are a few disadvantages to disk drives as opposed to cassette recorders, but most people find the balance weighs heavily in favor of disks.

Probably the biggest disadvantage is the one alluded to in the second part of your question: the higher cost of a disk drive. Ironically, a year or two ago your question would have seemed strange to most computer hobbyists, because at that time \$450 or even \$550 was considered a good price for a disk drive. Since then, prices of personal computers have been dropping as drastically as were prices of hand-held calculators in the mid-1970s. However, as you've noticed, prices of certain peripheral equipment — such as disk drives and printers — have dropped relatively less. There are two general reasons for this.

First, computers are largely solid-state devices with virtually no moving mechanical parts except for their keyboards. Their major components are silicon "chips" — memory chips and microprocessors. Rapidly declining manufacturing costs for chips account for much of the computer price-cutting. But disk drives and printers are more mechanical than electronic. They are complex machines with scores of precision moving parts. It is much harder to cut costs because mechanical technology is not advancing nearly as fast as electronic technology.

Second, the well-publicized price war of 1982-83, primarily between Atari, Commodore, and Texas Instruments, forced computer prices to drop even lower. Peripherals were not as affected by the price war partly because many dealers were selling computers "at cost," and then depending upon peripherals and software for profits.

For these reasons it is likely that prices of disk drives and printers will continue to decline only slowly. It is difficult to economize without sacrificing precision and reliability. Cassette recorders, at less than \$90, will remain attractive alternatives.

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The greater complexity of disk drives accounts for their other disadvantages as well. Recorders are easier to use, particularly by beginners. They offer fewer features, fewer options. There is no Disk Operating System (DOS) to worry about, and no menu of disk commands to learn. Too, disk drives are sensitive to bumps and jolts when moved from place to place. The read/write head (analogous to the play/record head in a cassette recorder) requires extremely precise alignment for reliable operation. Plus, when a cassette recorder does break down after the warranty period, it can probably be fixed by any good audio equipment repair shop. A disk drive must be fixed at a special service center.

These factors must be balanced against a disk drive's much greater speed, flexibility, capacity, ability to use a wider variety of commercial software, and greater reliability of storage.

To answer your specific question about alternatives to the Atari 810 drive, there are several units now being sold by independent manufacturers. They are regularly advertised in COMPUTE! and other computer magazines. They are not significantly less expensive than Atari drives, but some do offer more storage capacity at a lower price. You should visit your local computer dealer or write the manufacturers for more detailed information.

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Millionaire

Gary M. Kaplan

Blue Chip Software isn't making claims about *Millionaire's* ability to sharpen your stock market investment skill, but it's certainly a vehicle for learning investment finance, and a whole lot of fun. It's available on disk for the Atari 400/800, Commodore 64, Apple II and III, among other computers.

When you first play *Millionaire*, you begin at the Novice level with a \$10,000 stake. With it, you can buy and sell 15 different big name stocks in five industry groups. If you like the look of oil and gas, you can own shares in Conoco, Exxon, and Mobil. If you are feeling bullish about the auto industry, General Motors, American Motors, and Bendix are up for grabs. A retail group, a heavy industry group, and (since it's a computer game) a computer group, round out the industries. Purchase decisions are based on a steady stream of business information you'll have to wade through.

Millionaire creates 91 weeks of stock market fluctuations and starts you out at week 14 with access to the preceding weeks' data. From there, you're on your own — either to the good life, or the poorhouse.

Reading The Market

Analysis is the key to your future. And, just like the real market, there's plenty to examine. Each week you'll be given the variables creating the market's present environment. These

include corporate histories; a stock market graph showing the overall market trend; industry group graphs showing how each industry is doing; individual stock graphs; stock price tables; and a News Journal with company announcements which may affect business.

A news item might inform you of an IBM technology innovation. That could well mean a rise in IBM stock, but could also affect the entire industry. The value of Control Data and NCR stocks might well tumble.

After you've digested the current state of the market, and determined what is relevant to your potential investments, you're ready to make a transaction. Taking a cue from Wall Street, *Millionaire* is a little cold-hearted to those at the Novice level, where you work on a strict cash basis. If you want to buy stocks, you've got to put up the actual greenbacks.

Upward Mobility

Shrewd maneuvering will propel you to the Investor (\$12,000) plateau. Since you're building your fortune, options are opening up. At this level, you can buy on margin (borrow a percentage of the total purchase price of your stocks). Even greater flexibility comes if your fortune increases.

A Speculator (\$18,000) is eligible to use *call* options. They assume a significant rise in a stock and allow the buyer to purchase at a slightly higher price at a later date. A Professional (\$40,000) may use *put* options. They are used when you predict a significant decline in a stock and allow selling the stock at a slightly lower price. Players

at the Broker level (\$100,000) can borrow significantly from their net worth.

The road to riches is not smooth by any means. *Millionaire's* Wall Street is full of traps, and you might fall into any number of them. Your margin accounts may be called, or your capital could erode due to high interest payments and overextended credit. And there are those nasty brokerage commissions and taxes which take a bite out of your purse.

At week 91, your assets are converted to "cash," and a new game can be started at your new financial status. It's a long road before you reach the Millionaire level, but with persistence and a bit of wisdom, it's possible. Wealth — even on Wall Street — usually takes time to accumulate, and *Millionaire* recognizes that financial reality.

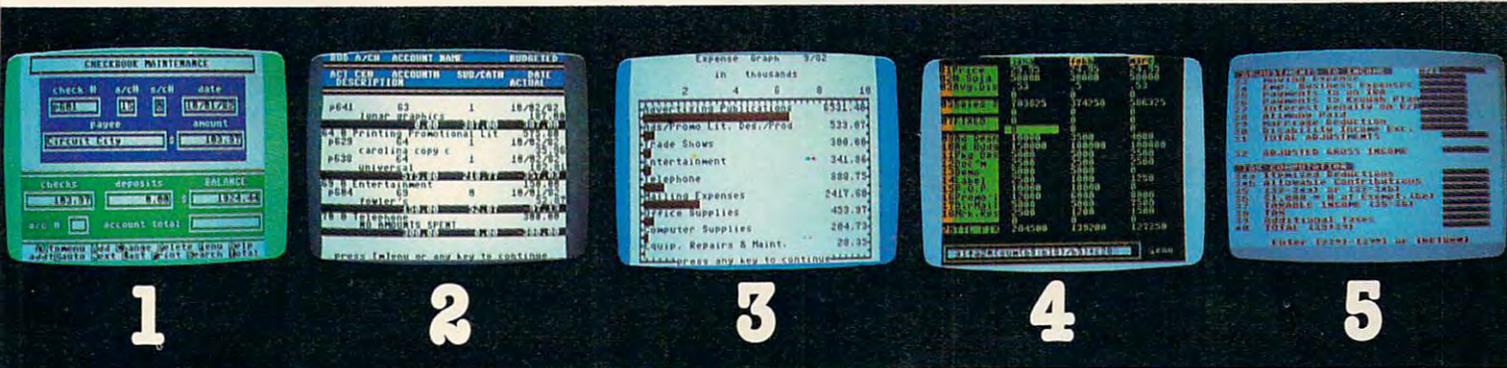
Only one person can play at a time, but the names and status of 14 players are retained. (Two or more can play together, providing they come to a consensus on investment decisions.) You can also stop and save the game, picking up where you left off later. Actual game time is approximately two hours.

Millionaire is challenging and provides quite an education in the art, or science, of playing the stock market. It's ideal for beginners because it grounds them in market basics. People with market experience will like it because it's frustratingly true-to-life. For anyone, it's a lot of fun.

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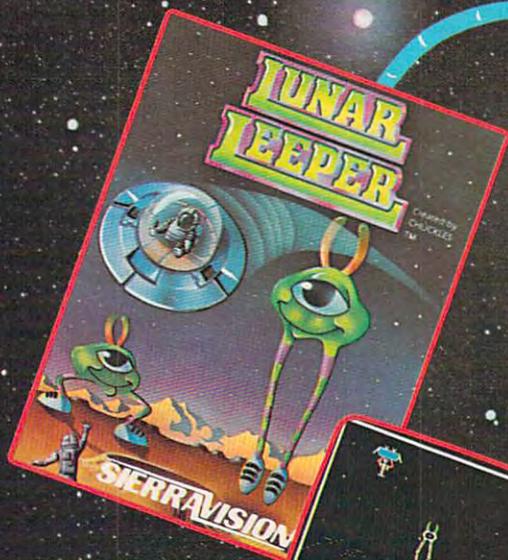
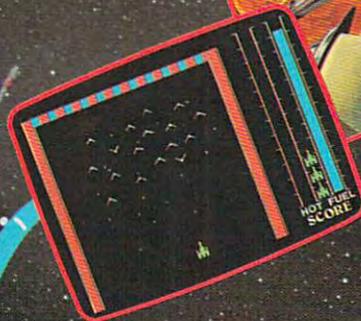
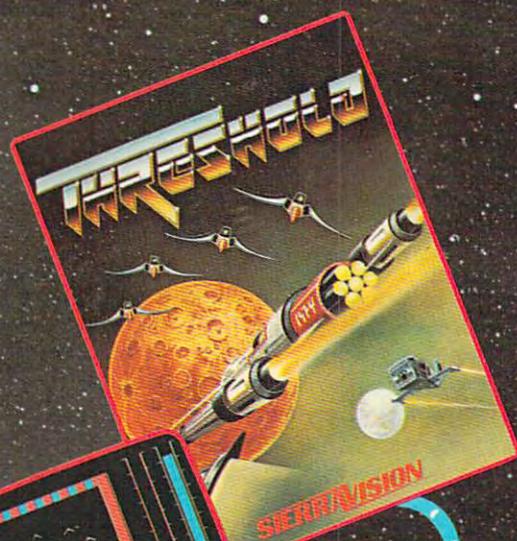
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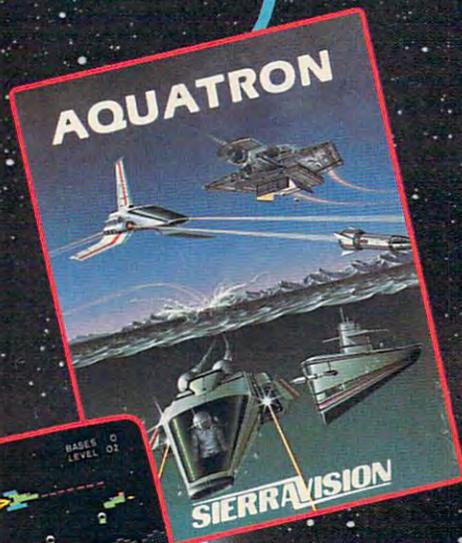
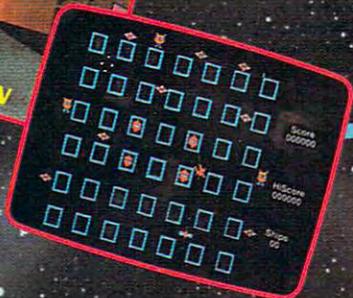
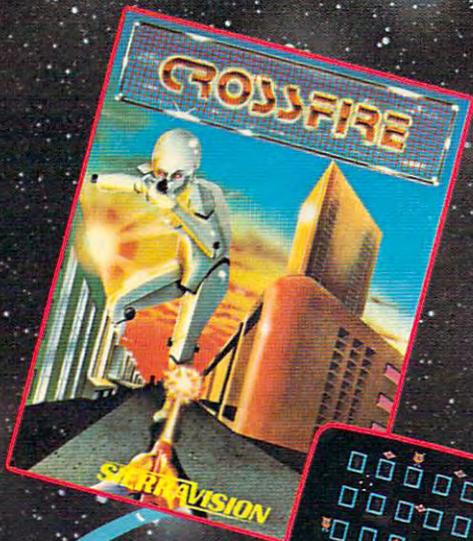
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The Witness

Dan Gutman

Monica *could* have shot her father, Freeman Linder. She had every reason to — her mother had said in her suicide note that she just couldn't take Freeman anymore. Coincidentally, Monica is now the heiress to his fortune, and besides, she left the house only a few minutes before the gunshots shattered the window and Linder died.

Then again, it could have been Phong, the poker-faced butler, who was promised a fortune by Linder — and never got a thin dime. And what about Stiles, Mrs. Linder's secret lover? The poor guy's been in a state since her suicide — or was it murder? He knows Linder ignored his wife, and Stiles was rumored to be a "hired mercenary" in 1907. The case is yours to solve.

The Witness is the latest in Infocom's masterful series of all-text adventures, and it may be their best one yet. The game, available in versions for most microcomputers, takes us back to the Thirties. The writing is colorful, like a pulp detective novel, and reflects the period. At one point Monica tells you this new actor (Bogart) she saw in a movie is not going to make it big. With games like this, the distinction between reading a novel on disk and playing a game has become blurred. *The Witness* is a novel, except that you are one of the characters, and every move you make affects the outcome.

Talking To The Computer

Other adventure games restrict you to simple commands like "go north" and "shoot gun." With Infocom's "Interlogic" programming system, the computer can understand complete sentences. Communicating this way gives you a much stronger

sense that you are participating in the story. However, as the game freely admits, "English is my second language." The program will only answer two specific types of questions: ones asking for information and ones asking for the whereabouts of someone or something. You've got to be very careful with your phrasing. If you borrow a note from Monica and type "give back note," the computer will tell you, "You can't see any back note here." You should have typed "give the note back." Nevertheless, with a little cooperation on your part, the computer does a superb job of catching your drift.

If you get hooked on this game (and there's a good chance) you'll find yourself drawing intricate floor plans of the Linder house and jotting down notes to yourself. You will ruthlessly interrogate every suspect and shadow their every move. You will pick up every knick-knack on the mantelpiece and dust them for fingerprints or send them to the lab for examination. You will become frustrated, disgusted, and type rude suggestions into the keyboard. You could start arresting furniture just to see how the computer will respond. You will be possessed.

The Witness is somewhat like *Deadline*, Infocom's first mystery thriller, but *Deadline* tended to bog down as you ran out of leads to follow. Here you are provided with a loyal assistant, Duffy, who is more than happy to make plaster of Paris footprint casts for you, bring objects to the lab for analysis, and uncover little clues you might have overlooked. All you've got to do is "ask Duffy for help."

Infocom does not crank out games and hope that one will click with the public. Each game is so clever and so intricate that you know somebody put thousands of hours of work into it. The game is a piece of art right down to the packaging, for

which Infocom has become famous. Out of *The Witness* package tumbles a suicide note, an urgent telegram, a newspaper page containing an article about Mr. Linder, a matchbook with some numbers scrawled on it, and a 12-page *Detective Gazette* with instructions for the game along with 1930s ads for handcuffs and fingerprint kits. And a floppy disk — can't forget that. With this game, you get your money's worth.

For Dedicated Players Only

However, as good as *The Witness* is, it's not a game for everyone. You have 12 hours to solve the crime, but do you have 12 hours to play a computer game? Fortunately, you can save your game on a blank disk and pick it up later. Even so, to investigate every room in the house, question every suspect, and follow up every lead may be equivalent to reading *The Complete Works of Shakespeare*. You can't just stroll around the house by typing "go to Monica's bedroom" or "enter the garage." It may take half an hour of directional search just to find Monica's bedroom, and she may have gone to the movies while you were bumping into the walls. To get in the room, you must first find the key, unlock the door, and open the door — all separate commands. To make matters more difficult, you have no way of knowing if a suspect is telling the truth or lying to you — that suicide note from Mrs. Linder could have easily been faked by Monica, Stiles, Phong, or even Mr. Linder. Infocom supplies no key to solve the mystery, and you may never solve it on your own.

The Witness requires a dedication that few other games require. There are no pretty graphics here. It's you, your imagination, and the words on the screen. My guess is that people who enjoy challenging puzzles — jigsaw, crossword,

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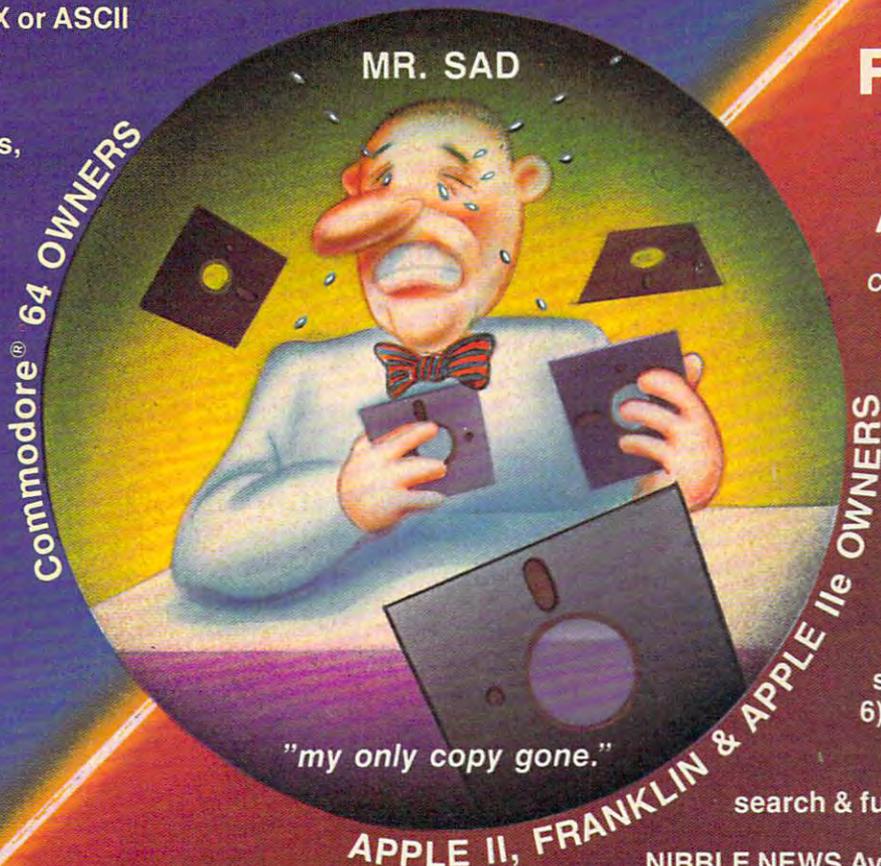
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anagrams — will enjoy *The Witness*, while those who favor television game shows may not. People who like to curl up with a good book — especially a mystery novel — will love it, while those who lean toward *Garfield Goes Condo* should pass it up.

For those of you who choose not to solve the crime, I feel it is only fair to share my findings with you. I have devoted the last three months of my life to this case and just moments ago solved the crime, arrested my suspect, and sent that person to jail. The murderer of Freeman Linder was...

Ed. note: Unfortunately, Mr. Gutman was unable to complete this review for reasons which are still under investigation.

The Witness
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of storing it in ATASCII format. This change alone would significantly increase the assembly speed, and would have three bonus side effects as well. First, with a tokenized format it would be possible to LOAD and SAVE source programs just as fast as Atari BASIC can LOAD and SAVE programs; there would no longer be any need to wait for the slower ENTER and LIST commands.

Second, through tokenization, the source file could be compacted to almost half the size of the ATASCII equivalent. The shorter, compacted files would LOAD in even less time, and take up even less disk space. And a condensed program size would make it possible to hold longer files in memory.

Finally, tokenization would allow error detection upon line entry. With the addition of other improvements such as a faster symbol table search, the revised assembler would be extremely fast. If the programmer added some other features like powerful conditional logic, an alphabetized printing of the symbol table, local labels, and macro support, he would have created the best assembler available for the Atari.

A Dream Come True

Stephen Lawrow has made all of these improvements and more, and his MAC/65 macro assembler is the answer to every machine language programmer's dreams. MAC/65 is currently available on the Atari for \$80 from OSS, and Apple and Commodore 64 versions are expected soon. This offers users of MAC/65 the added advantage of being able to use the same assembler on three of the most popular personal computers.

Conditional Assembly

Let's take a closer look at two of MAC/65's best features. The first is *conditional assembly* through the use of the directives .IF, .ELSE, and .ENDIF. The .IF di-

rective evaluates an expression and controls how the following code is assembled. If the value is true (nonzero), only the code between the .IF and the .ELSE or .ENDIF is assembled. Should there exist a .ELSE (it is optional), the code between it and the .ENDIF will be assembled if the value is false. It is possible to nest these conditional constructs. One use of conditional assembly is to let the same source listing produce both cassette and disk versions of a program. This feature is even more powerful when used with the operators .DEF and .REF, which tell whether or not a label has been defined or referenced.

Macro Assembly With Numeric And String Parameters

Macros are defined by the directives .MACRO and .ENDM, and consist of a sequence of frequently used source lines that are given a label. Whenever this label appears at any point in the source listing, the corresponding source lines will be inserted into the assembly. It's like a collection of automatic, prewritten subroutines. Here is an example.

```
1000 .MACRO SAVEREGS
      ;save registers on stack
1010 PHA
1020 TXA
1030 PHA
1040 TYA
1050 PHA
1060 .ENDM
...
...
5000 SAVEREGS
5010 JSR SOMEPLACE
```

The one call of SAVEREGS in line 5000 will cause five source lines to be assembled in its place. Note, however, that a macro differs in some ways from a subroutine; a macro only affects assembly, and since this example used the stack, SAVEREGS could certainly not be made into a subroutine (which stores a return address on the stack) without a stack conflict.

MAC/65

Craig Chamberlain

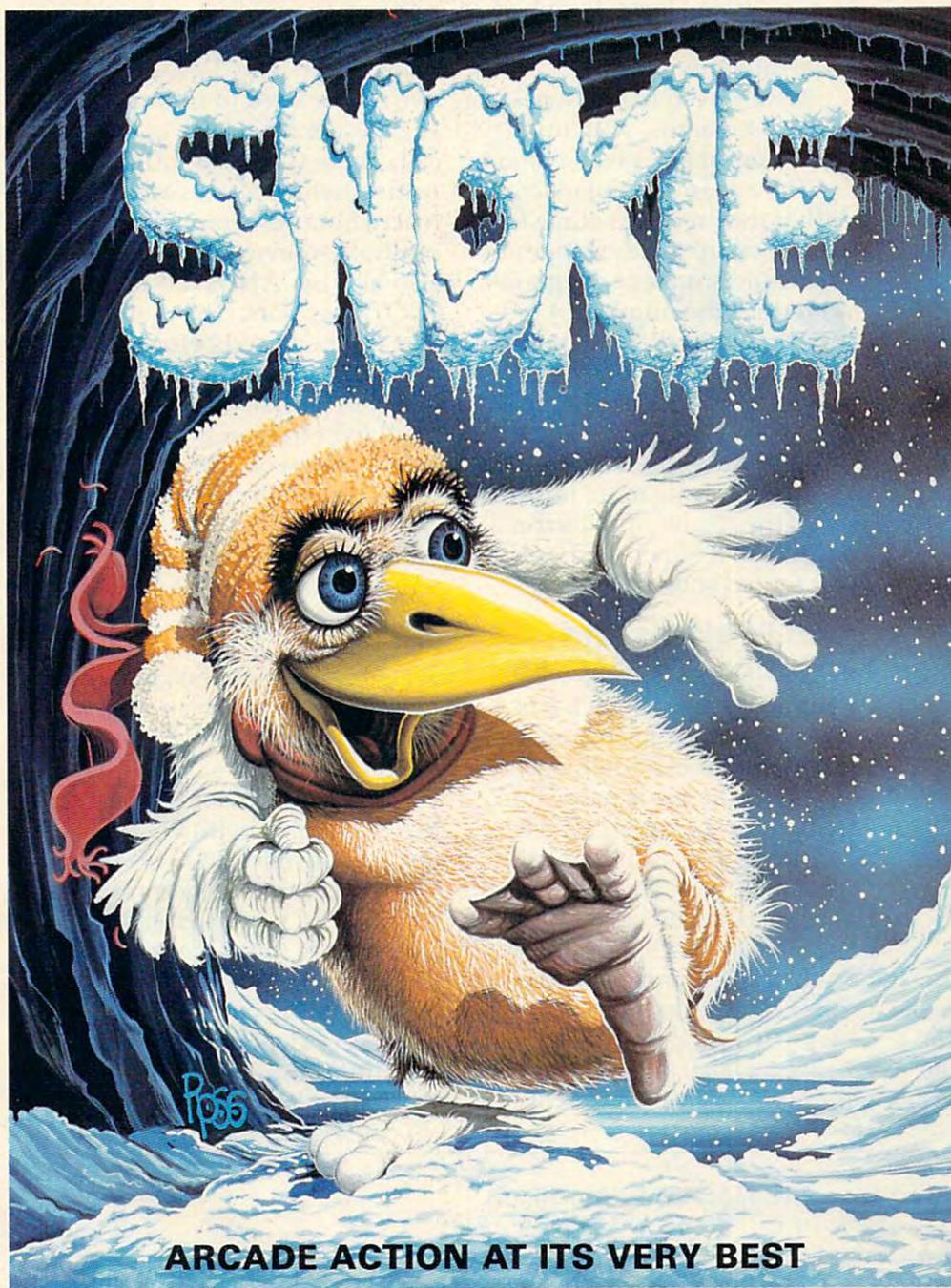
Atari's Assembler Editor cartridge is extremely slow. Time spent just waiting for it to assemble a program could be put to much better use programming and debugging, or thinking of new program ideas. For any programmer who spends much time at all using the Atari cartridge assembler, the accumulation of wasted time could be so substantial it might actually be worthwhile for the programmer to rewrite the assembler to make it faster.

Improving The Assembler

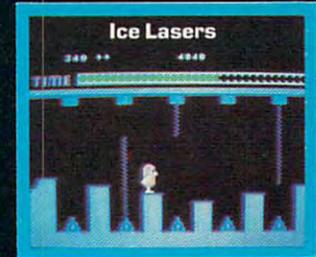
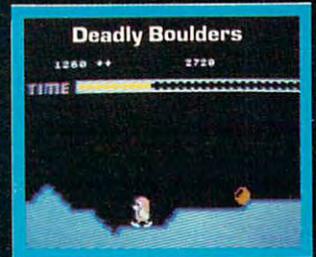
Suppose a programmer did decide to improve the Assembler Editor cartridge. For one thing, he would have the editor tokenize each source line, instead

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 Game design: **A. Marsily**

A macro can also be defined so that different parameters can be specified each time the macro is called. One good example is the macro defined here to increment a 16-bit memory location.

```
1000 .MACRO INC16
      ;increment a 16-bit number
1010 INC %1
      ;increment lo byte
1020 BNE SKIP
1030 INC %1+1
      ;increment hi byte
1040 SKIP
1050 .ENDM
....
....
....
5000 INC16 $600
```

At assembly time, the value \$600 is substituted for the symbol %1, and the assembler will generate the code to increment the 16-bit number at \$600. Another good example is the macro definition for OPEN, provided in the MAC/65 manual. Once this macro has been defined, it is possible to have a source line which reads OPEN 3,4,0,"D:FILENAME". This one source line will generate all the code necessary to perform an OPEN operation using channel 3, auxiliary bytes 4 and 0, and the specified filename. This takes a lot of the drudgery out of the tasks of writing in machine language.

In the definition of OPEN (not reprinted here), the symbol %1 would represent the first parameter, in this case a 3. The second parameter corresponds

to %2, and so on. String parameters are indicated using a dollar sign, as in %\$1. The symbol %0 is reserved to tell how many parameters were included in a macro call. Combine this with the conditional logic described earlier and you have some very powerful tools.

MAC/65 can handle a nesting level of 14 macros, with up to 63 parameters at any given instant.

The advantages of macros are that they reduce source file size, speed up the development of machine language programs, and reduce the number of programming mistakes. Typing the same code several times increases the risk of error, but a macro is defined only once. Also, a carefully chosen macro name can communicate more information to the reader of a source listing than a bunch of sparsely commented source lines.

Other Features And Limitations Of MAC/65

A local label is one which has a value in only one part of an assembly source. Another label, possibly of the same name but with a different value, can be used in another local section without conflict. This is especially useful when several programmers are each writing sections of a large machine language project. Through the use of local labels, each programmer can use whichever label names he wants, without fear of causing "dupli-

cate label" errors by using label names already chosen by the other programmers. Local labels are possible in MAC/65 with the .LOCAL directive.

The directive .BYTE will print up to four byte values per assembly line, which can save a lot of paper. The .ERROR directive can be used to report errors, such as the illegal use of a macro call. There is an .INCLUDE directive, which allows access to macro libraries, equate files, and multiple source files. There are also bitwise .AND, .OR, and .NOT operators. The operators > and <, when used before an expression, return high and low byte values. This is an improvement over the common, but error prone, usage of /256 and &255.

The RENumber, FIND and REPlace commands of the editor are usually satisfactory, but it would be nice to have a MOVE command. MAC/65 will work only on a 48K machine and is available only on disk, but these two problems will be solved if OSS releases MAC/65 on a cartridge.

It should be noted that MAC/65 comes with OS/A+, the no-nonsense DOS from OSS. OS/A+ is completely compatible with DOS II because the disk routines are the same, but the DUP portion of DOS II has been replaced with a monitor that is always resident and takes up very little additional memory. You can quickly read a disk di-

Atari Assembler Editor Cartridge And MAC/65 Comparison

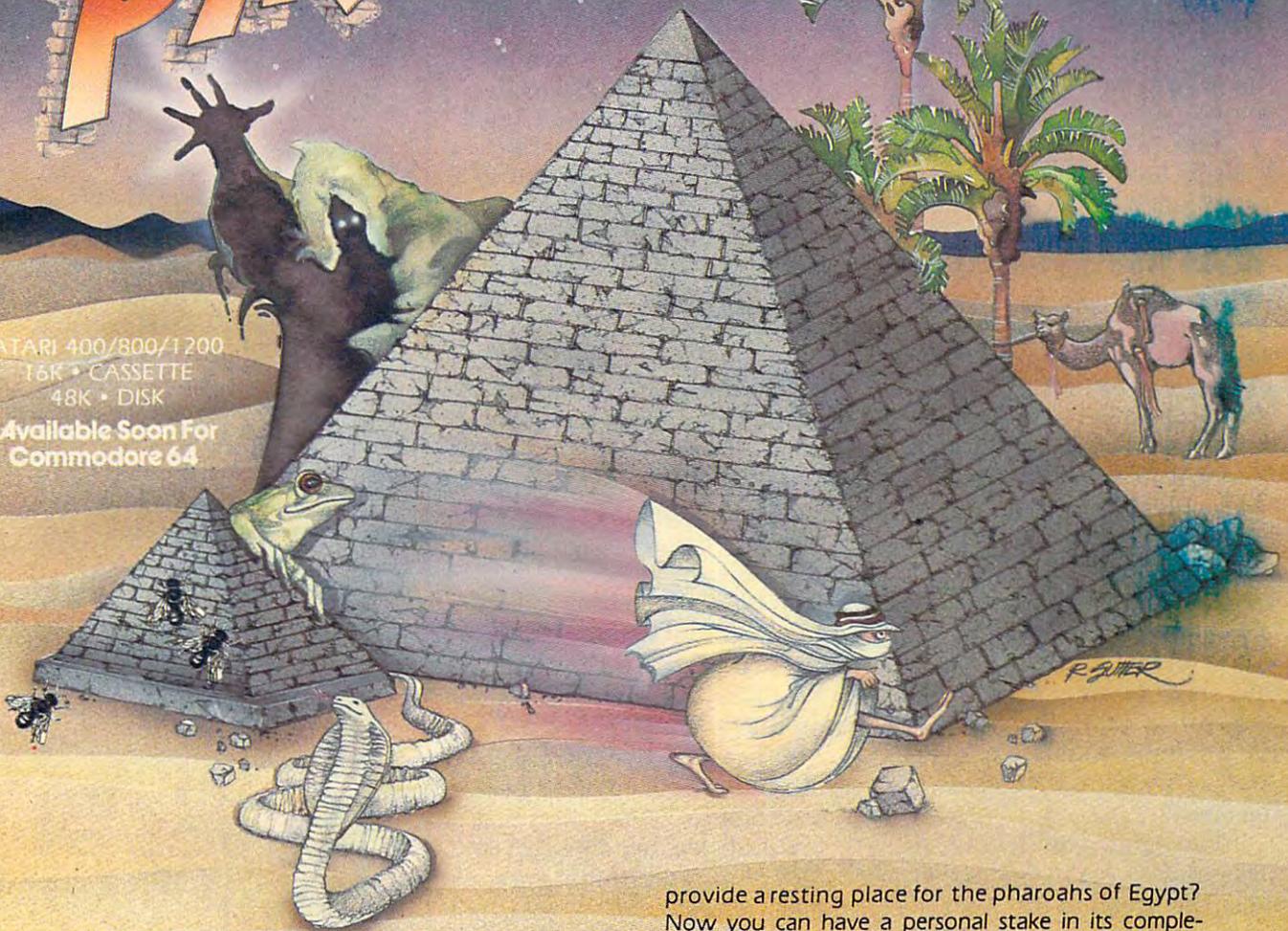
The test file contained 962 lines of nicely formatted, commented code, and made extensive use of labels but no macros. Macros will slow down MAC/65. The object file was about 2500 bytes. All assembly times are with listing turned off. EASMD is OSS's disk version of Atari's ASM/ED, and is nearly identical to the cartridge.

	EASMD	MAC/65
DISK FILE SIZE (SECTORS)		
(ENTER FORMAT)	231	
(LOAD FORMAT)		133
FREEMEM (BYTES)	30207	28031
TIME TO ENTER (SECONDS)	96	82
TIME TO LOAD	-	0:15
FREEMEM WITH PROGRAM	02389	11489
ASM MEMORY TO MEMORY	323	less than 5 seconds
ASM DISK TO DISK	444	50

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rectory or unlock a file without erasing your program, and there is no need for the questionable MEM.SAV file.

Speed

MAC/65 is amazingly fast. For relatively small programs, no sooner do you type ASM and press the RETURN key than the assembler starts printing the second pass.

The incredible speed of this MAC/65 has greatly increased my productivity as a programmer, not just because it assembles programs faster, but also because while waiting for the old cartridge, I would often switch the television channel and become interested in a show. Now with MAC/65 there's no time to get distracted.

MAC/65 can assemble source files so fast (for memory to memory with no listing, it takes just a few seconds at the most) that the actual assembly speed becomes almost irrelevant. When assembling from disk, the only thing holding MAC/65 back is the slowness of the disk drive. For a comparison between the Atari cartridge and MAC/65, see the chart.

The Apple version of MAC/65 assembles from disk to disk at twice the speed of the Atari, due to the faster speed of the Apple disk drive.

Reference Manual

MAC/65 comes with a reference manual which gives complete descriptions of all commands, operators, directives, and errors. It is not a tutorial and does not teach machine language. A small macro library is also provided to get the user started. The manual could stand improvement, but it is a good manual, covers all necessary topics, and contains examples.

Compatibility With The Atari Assembler Editor Cartridge

Here is a list of all the differences

between MAC/65 and the Atari cartridge.

1. Source files are completely upward compatible with one exception. MAC/65 uses an algebraic operating system with different precedences for different operators (like BASIC), while the cartridge performs all operations from left to right. Expressions like LABEL + 2/256 will have to be rewritten using brackets, such as [LABEL + 2]/256.

2. MAC/65 has a TEXT mode which turns off the error checking upon line entry, so the editor can still be used to do things like renumbering Atari BASIC programs.

3. There is no DEBUG mode. Only the commands C and D (change and display memory) have been kept. All the other debugging features, including memory manipulation, breakpoints, the instant assembler and the disassembler, are available in BUG/65, an interactive debugging tool which comes with MAC/65.

4. The .INCLUDE files must be in SAVE format.

5. The directive .PAGE now prints at the bottom of a page, not at the top.

6. Bulk line deleting is faster.

7. FIND and REPlace are slower, because the source is not stored in straight ATASCII.

8. Although MAC/65 still does not print a total error count at the end of an assembly, it does at least list all errors to the screen, even if the output is directed to another device such as the printer.

9. Automatic page numbering.

MAC/65
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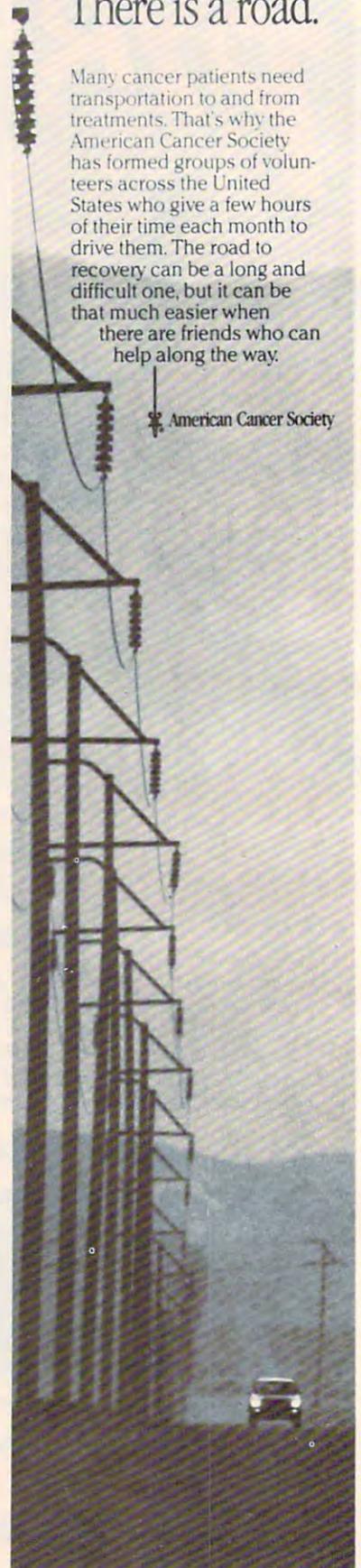
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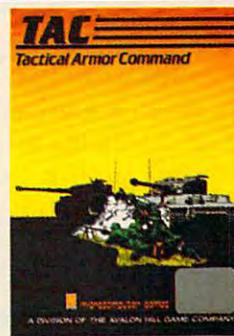
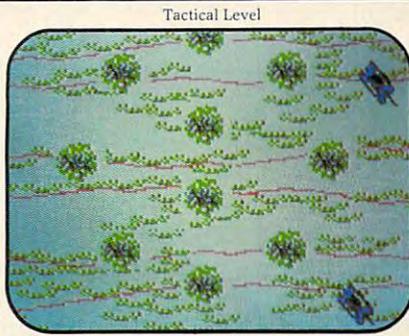
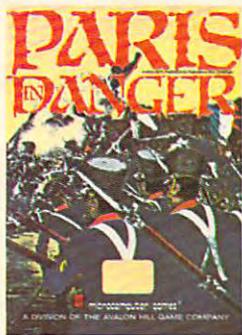


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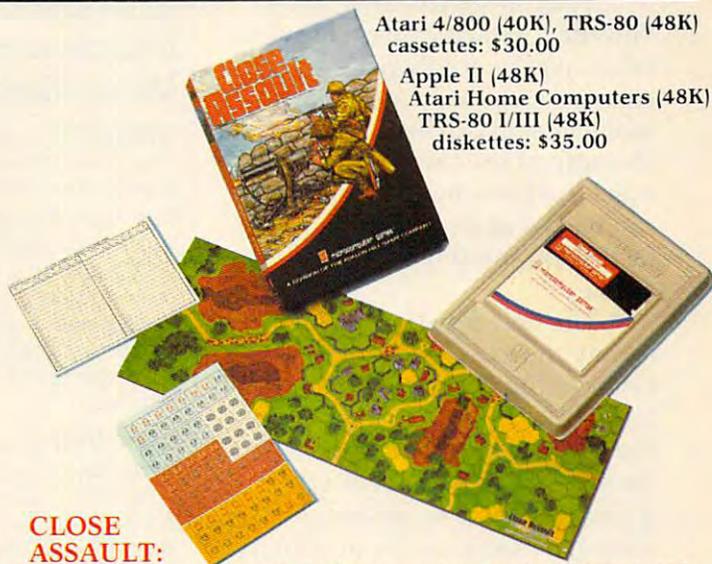
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Stellar Triumph

Eric Brandon

Space games have nearly become clichés in the world of video-games, but *Stellar Triumph* from H.A.L. Labs is a fun and unique addition to any Commodore 64 game library.

Stellar Triumph pits two players against each other in mortal combat. Each player is given a spaceship, fuel, and up to 32 shots. You can rotate your ship, or thrust either forward or backward with your engines. The objective is simple: Beat your opponent before he beats you.

Playing By Your Own Rules

What makes the game so interesting is the control you have over the "rules" that govern combat. Using simple menus, you can define an incredible number of variables resulting in great variety.

Your ship can either have "inertia," which causes it to drift when you're not thrusting, or it remains stationary until you move it. You can also define the strength of the thrust, and how much fuel you have. Your shots can be fast or slow, and they can be fired in rapid bursts or one at a time.

The best feature, however, is that you can define the properties of the universe you play in too. For example, the gravity of the sun can be either weak or strong, positive or negative (pulling you in, or pushing you away), or there can be no gravity at all. Just to keep things interesting, you can include asteroids to crash into, aliens which shoot at you, and the "mysterious monoliths" that sometimes bounce your shots.

The game is fascinating to watch when you select high gravity. Objects can go into orbit around the sun, and you can use the gravity to speed yourself up

as you go around the sun.

Many people do not have two joysticks since so few games allow two players. In *Stellar Triumph*, either or both players can control their ship from the keyboard.

Because you have so much control, your \$25 buys you much more than one game. By setting the parameters correctly, you could have a tank battle, an air-plane dogfight, or, of course, any number of space battles. If you don't feel like defining the universe, you can always play one of the eight predefined games available, simply by pressing the function keys.

Overall, *Stellar Triumph* is an exceptionally enjoyable game to play, and it offers you the chance to play a human opponent rather than the computer.

Stellar Triumph
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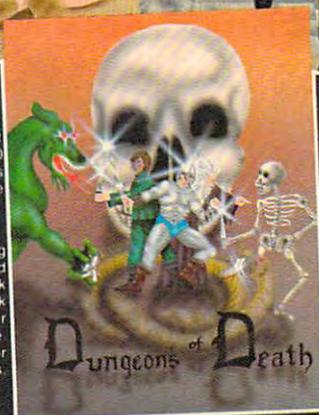
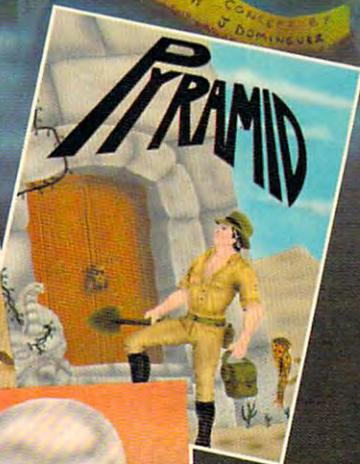
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Gamestape 1 For The Timex/Sinclair

Arthur B. Hunkins

Melbourne House produces remarkably high quality software for the Timex/Sinclair. In this review, we'll look at an excellent package, *Gamestape 1*, which contains 11 games for the 1/2K Timex/Sinclair. All programs run in 1K, and – what is really remarkable – all but one are in BASIC. (Thus, ten of the eleven are listable, and serve as an excellent source of ideas for economical, imaginative, simple game and graphics programming.)

Educators will particularly enjoy their use of PEEK, INKEY\$, CODE, SCROLL, PRINT AT, RND, AND, and OR. (This tape is worth purchasing as a tutorial alone.) Nonetheless, the primary purpose is fun, and fun there is. I will evaluate the games on a scale of one to ten, with ten being high. Parenthetically, it is a real joy to play games that don't take over five minutes to load and then freeze up. Also, the tape exhibits no LOAD problems.

Klingons – 9. Ram as many of the oncoming fleet of 200 Klingons as you can. Pay particular attention to the high-score motherships. Good for hand-eye coordination. Self-competitive scoring.

Crash Landing – 5. A Lunar Lander without graphics – cockpit readout only. Requires patience and time. Program bombs with error message if you crash.

Simon – 6. Flashing sequences of four colors (names) that must be repeated by responding with first letters (within 30 seconds).

Artist – 8. Simple, quarter-square drawing program that can dump the screen to a printer. Positioning is by cursor control arrows and quarter-square diagonals. All keys repeat, and

you can erase as well as draw, reposition, or clear screen.

UFO – 7. Fire at stationary aliens from a moving spaceship. 100 points possible; penalties for going off the screen and missing. Spaceship goes faster as game progresses. Good for hand-eye coordination.

Code – 9. Version of *Mastermind* – guess a four-digit number in ten tries (number of tries can easily be changed in program). Each digit is different, and program cannot handle responses that contain repeat digits. Challenging.

Asteroids – 3. Dodge asteroids by maneuvering right or left; continues until you crash. Self-competitive scoring. Simple and somewhat boring, except for youngsters developing hand-eye coordination. Autorun.

Bomber – 6. Bomb ten dams. Runs shorten as your aim gets better. Highly repetitive, but represents a more complex hand-eye coordination challenge.

Kaleidoscope – 5. Typical symmetrical quarter-square graphics in center of screen. Interest limited by quarter-square graphics. Program demonstrates effective use of PLOT and UNPLOT (erase) to achieve

pattern. Autorun.

Guillotine – 10. Version of Hangman. You get ten wrong guesses as the guillotine is built; at the tenth wrong guess, your head gets chopped off. This is the only two-player game; one player has to furnish the word. When a correct letter is guessed, all occurrences of it are filled in. The program accepts words as long as antisestablishmentarianism. Simple yet effective graphics.

Breakout – 10. This is *the real winner*, and the only program in machine language. Most programs on the Timex/Sinclair are turtle-slow – *not this one*. Three speeds and two bat sizes may be selected. I challenge any *Breakout* pro to achieve a respectable score at the most difficult level. About half of the time my score was zero. It's a major challenge just to get in position to hit the first ball. On the other hand, at the lowest level, any beginner should be able to compile a respectable score.

Gamestape 1 includes an insert which gives adequate instructions. With only 1K, expect simple, functional (and in BASIC, slow) graphics – nothing fancy. This package is a real bargain at \$14.95.

Gamestape 1
Melbourne House Software, Inc.
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New York, NY 10017
\$14.95

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Memory Expanders For The VIC-20

Ottis Cowper, Technical Editor

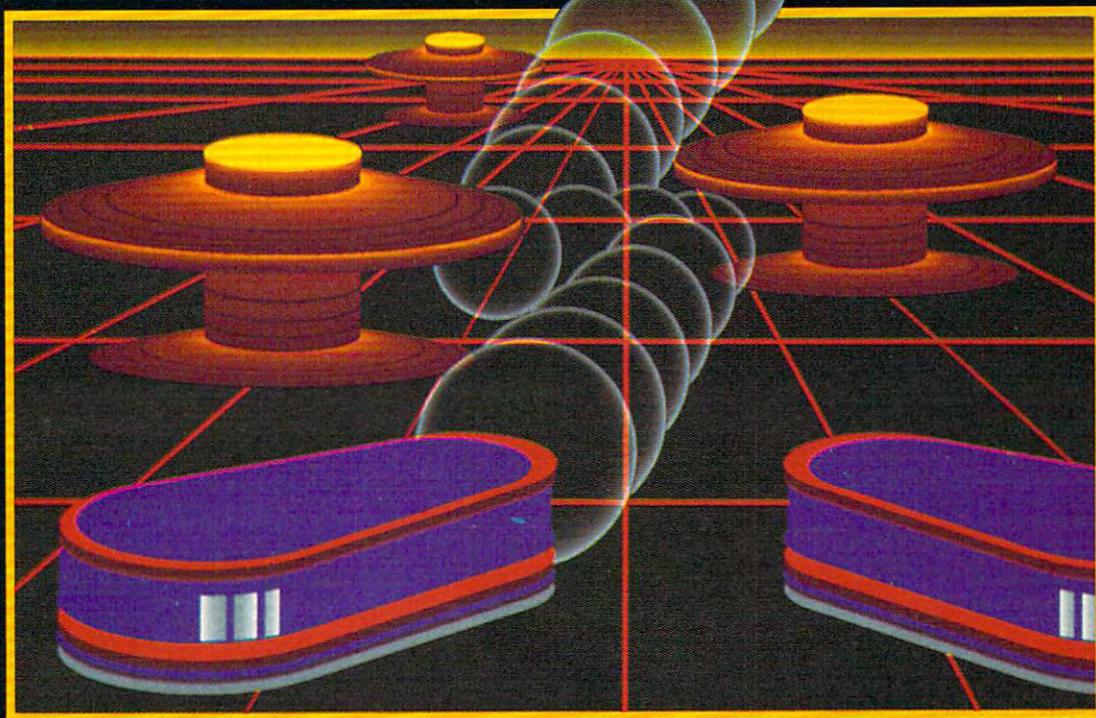
Creative users have developed programs of surprising sophistication for the unexpanded VIC. However, some programmers have felt that working within the 3583 bytes left after BASIC grabs its share of the 5K of built-in memory puts unacceptable constraints on their creativity. As a result, memory expanders

for the VIC began to appear very soon after the computer itself hit the shelves.

The simplest form of memory expansion is the RAM cartridge, which plugs into the memory expansion port on the back of the VIC. They usually expand memory in multiples of 8K, although the first VIC mem-

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ory cartridges added only 3K. Some of these are still in circulation. The great advantage of the cartridges is their simplicity — just plug them in. The main disadvantage is a certain lack of flexibility: It is necessary to remove the memory cartridge to plug anything else into the expansion port — a game cartridge or the Super Expander, for example. This can be overcome by using a *motherboard*, a device which plugs into the memory expansion port and acts like a multioutlet extension cord for the port, and there are as many different motherboards available as there are RAM expansion cartridges. A second disadvantage is that it is not as easy to change the address range of the added memory when using cartridges as it is with some of the more complex expansion systems. This, however, really should not present a problem for most users.

Commodore RAM Cartridges

Commodore makes two expansion cartridges for the VIC: the VIC-1110, which provides 8K expansion, and the VIC-1111, which provides 16K expansion. An added feature of the 8K cartridge is that it can be set to one of four address ranges, and, if you have a motherboard, can be used in conjunction with the 16K cartridge to provide 24K expansion, the maximum amount VIC BASIC can use without special programming.

RAMAX By Apropos

RAMAX, made by Apropos Technology of Camarillo, California, is something of a fusion of a RAM cartridge to a motherboard. It provides 27K of expansion RAM and two additional cartridge slots. A DIP switch allows you to selectively activate 24K of the additional RAM in three 8K blocks. The additional 3K block, if activated, goes to fill a hole in the unex-



Various memory expanders are available for the VIC.

panded VIC's RAM space between locations 1024 – 4095 where no built-in memory is installed. This is the same 3K block filled by the additional RAM in the Super Expander cartridge, and by the 3K plug-in cartridges. The 3K block can be added alone or in conjunction with any of the other 8K blocks. However, BASIC cannot use the 3K block along with the 8K blocks without special programming. With the 8K blocks activated, the 3K block can be used to hold redefined characters and machine language subroutines.

If a block of memory containing data is switched out, the data is still maintained until the computer is turned off. If the memory block is switched back in, the data can be accessed as before.

The two expansion slots can be used for game cartridges or for utility packages like VICMON or the Super Expander. However, the slots are not switched, so you must avoid inserting two cartridges which use the same address at the same time. There is a DIP switch on the RAMAX which disables memory in the range 40960 – 49151, the area used by most cartridge game ROMs. This provides a way to effectively switch on and off a game cartridge plugged into one of the slots.

There is one additional DIP switch on the RAMAX which provides a valuable feature: the *warm start reset* switch. If you've ever experienced a "lock up" resulting from a bug in a machine

language program, you've probably wished for something that would allow you to regain control of your computer without having to turn it off. That's what the reset switch does.

The RAMAX draws its power from the VIC, but adds a 0.5 amp fuse to protect the computer from any short circuits on the board. This proved to be a valuable safety feature. On several occasions programmers here at COMPUTE! failed to heed Apropos' warning that cartridges should not be installed or removed from the RAMAX while the power was turned on. This resulted in blown fuses on the RAMAX. And without the fuse the VIC itself might have been damaged.

The RAMAX comes with a ten-day money-back guarantee and a six-month warranty on parts and labor. An extended service contract is also available. We were most impressed with Apropos' customer service. Shortly after we received our first RAMAX, Apropos detected a possible defect in the RAMAX and recalled for modification all boards that had been shipped. We had our new RAMAX back in a matter of days.

The RAMAX also comes with a very complete brochure explaining all the available memory configuration options.

Golden RAM By Voice World

The Golden RAM Expansion Chassis made by Voice World of Del Mar, California, offers exceptional flexibility in configuring the expansion memory. The Golden RAM has 24K of memory in three 8K blocks. Each block can be installed at one of two starting addresses. One of the blocks can be switched to start at location 40960 (\$A000), which is a special block in the VIC. Programs starting there, and beginning with the proper character sequence, will run automatically after a system reset. This is how

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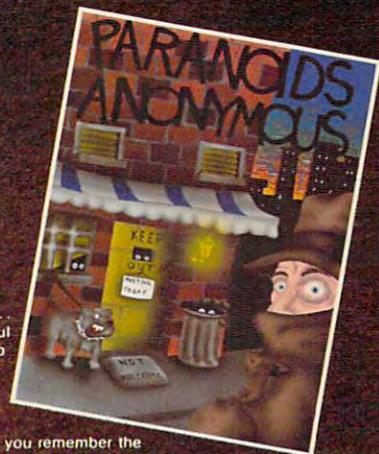
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cartridge games are made to start when the computer is turned on. As with the RAMAX, data is not lost when the blocks are switched in and out. Also, two of the 8K blocks of RAM can be switched to a *read only* mode in which they emulate ROM and cannot be overwritten (although all data is still lost when the power is turned off). These special features could be very valuable to those involved in serious program development, although the casual user may never find a need for all of them.

The Golden RAM includes four cartridge expansion slots. An excellent feature of this expander is that the four slots can be switched in and out. It is possible, for example, to leave your four favorite game cartridges plugged into your VIC at all times and simply switch in the one you wish to play. This ends the need to constantly plug and unplug cartridges. The Golden RAM also has a reset switch, a large push button which is a significant improvement over the tiny DIP switch for reset on the RAMAX.

As with the RAMAX, the Golden RAM draws its power from the VIC. It is equipped with a 0.5 amp fuse to protect the VIC from short circuits. A spare fuse is also supplied.

The Golden RAM comes with a full one-year warranty.

VIC-1110 8K RAM Cartridge
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TI Statistics

Roger B. Crampton

In many professions there is a need to analyze something statistically. Engineers, medical researchers, psychologists, and social scientists often must generalize from data samples and make predictions concerning the probability of events. Not many years ago this data analysis was a tedious and expensive task, using calculators and many clerical assistants to perform manual computations.

In addition, because the mathematics of statistics appear so formidable, professionals often hesitate to try to explain the implications of their data.

Texas Instruments has helped remove some of this anxiety with its *Statistics Command Module*, a series of programs that perform dozens of the most commonly needed statistical techniques.

The module leads the researcher through the procedures of statistical analysis in a friendly and efficient way. The only hardware requirements for running complicated statistics programs are the TI-99/4 or 4A console, a monitor, and the module. While not essential, a printer and a cassette or disk drive will eliminate having to reenter the data set and file structure if you want a second look at your findings.

Learn The Basics First

Before plugging in the module, it is important that you thoroughly read the 48-page instruction manual at least twice. The time spent will be rewarded with a clear understanding of the module's capabilities and a basic understanding of statistics itself.

When the module is inserted into the console, a title screen is displayed, followed in a few seconds by the first of several

menus (see Figure 1).

Figure 1: Program Options

PRESS

- 1 TO CREATE A NEW FILE
- 2 LOAD AN EXISTING FILE
- 3 USE SIGNIFICANCE LEVEL CALCULATOR
- 4 QUIT

Typing 1 allows you to set up your file structure. You name each variable, determine its type (alphanumeric, integer, decimal, or scientific notation), and enter the maximum number of digits of each variable. The number of variables allowed depends on the width of each entry and the number of observations. Conversely, the number of observations that you will be able to enter depends on the number and specifications of the variables you have selected. It is important to carefully define the parameters of the problem so that you will be able to use all of your observations without getting a MEMORY FULL message.

Another reason for care when you specify the initial file structure is that there are no provisions for editing file specifications once they have been set up.

When the file structure has been established, the next menu will be displayed (see Figure 2).

Figure 2: Basic File Structure

MAIN INDEX

PRESS

- 1 TO SEE FILE DEFINITION
- 2 ENTER OBSERVATIONS
- 3 CHANGE OBSERVATIONS
- 4 ANALYZE DATA FILE
- 5 SAVE DATA FILE
- 6 QUIT

At any time, you can return to the main index, select option 1, and review the specifications of the file. But remember, you don't have a chance to change anything, unless you're willing to reenter the entire file definition.

Entering Data

When you are certain that your file is arranged exactly as you

want it, it's time to select option 2 and begin entering data. The module will prompt you with the names of the variables as each is typed in.

Data entry is slow. A fast typist must slow down to about half speed because the module will not accept entries at usual typing speed. The first variable value will be accepted, but the initial digit of the second or succeeding variables often gets lost. An entry of 84 becomes 4, an entry of 1.3794 will become .3794.

After all your data has been entered, you can verify its accuracy by selecting option 3 from the menu and single-stepping through your data set, making any changes that are necessary. There is no provision for LISTING your data to a printer to check each observation for accuracy. This would be desirable, especially to see that decimal data is properly entered.

Analyzing The Data

At last the preliminaries are completed, and you're ready to get down to the real purpose of the program: looking at your data from a statistical point of view. By pressing option 4 of the main index you are given a new menu (see Figure 3).

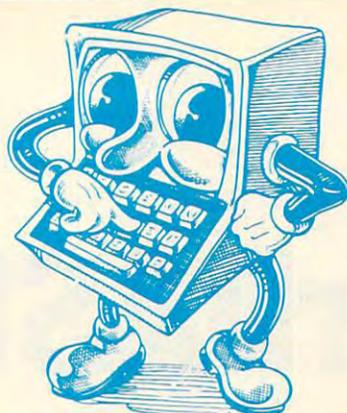
Figure 3: Analysis Options

ANALYZE DATA FILE

PRESS

- 1 FOR DESCRIPTIVE STATISTICS
- 2 CORRELATION
- 3 LINEAR REGRESSION ANALYSIS
- 4 INFERENCE STATISTICS
- 5 TO EXIT THIS SECTION

Each of the four options is thoroughly described in the user's manual. Few researchers will need all of the procedures available. In fact, it may be best to learn to use one technique at a time. The enormous amount of information from the analysis of even a simple data set can be overwhelming.



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Although the *Statistics Command Module* can provide volumes of information about a data set, it does have limitations. Evaluation of a great deal of information can be hampered by memory problems if the module is used without memory expansion. In addition, no provision exists in the program to screen out data entry errors by specifying acceptable ranges for each variable.

For nonprogrammers who need a means of analyzing fairly simple data sets, however, the module can be a useful tool. And for anyone seeking a relatively painless introduction to statistics, it is superb.

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SuperBASIC 64

Martin C. Kees

How would you like to be able to access 37 valuable new commands when you're programming on your 64? SuperBASIC adds sprite, color, graphics, sound, and memory management features and also enhances eight of BASIC's own commands. And it's designed to work as easily and as quickly as any ordinary BASIC instruction. Typing it into your computer is foolproof; you won't be allowed to go on to the next line if you make a typing error. (See the instructions for using the MLX entry method, on page 216.) Once you try it, you'll wonder how you programmed without SuperBASIC — it's an especially valuable addition to any 64 owner's library of programs. As a bonus, there's also a PET emulator and several demonstration programs so you can see SuperBASIC in action.

SuperBASIC adds commands to BASIC using a special technique. BASIC is automatically copied to its matching RAM and modified to change the STOP command to a wedge vector (similar to Apple's ampersand (&) wedge). The character chosen was the left bracket ([). Then, using four-letter mnemonics following the wedge character, you can select what you want SuperBASIC to do.

These machine language routines make it very easy to control virtually all the VIC-II chip special features. Sprites and hi-res graphics can be controlled from BASIC without having to POKE or use Boolean functions to enable special graphics modes. Since BASIC was moved to RAM to implement the [wedge, this made it convenient to enhance a few BASIC commands. I added the use of variable expressions for GOTO and GOSUB, and RESTORE by line number. These changes to BASIC in RAM don't slow execution as they would have if CHRGET wedging techniques had been used.

SuperBASIC Command Format

The commands can be used in both direct or program mode. The general format is [xxxx <exp>, <exp> where xxxx represents the four-character mnemonic and <exp> is a number, variable, or a valid BASIC expression. When a color is selected, use the standard value ordinarily POKEd to the VIC chip. I have used the same coordinate system for sprite positions as given in Commodore documentation. The hi-res upper-left corner is 0,0, and the lower-right is 319,199. Commands that switch a function on or off use 0 for off and 1 for on.

SuperBASIC includes two types of changes to normal BASIC, enhanced commands and new commands. Enhanced commands include GOTO and GOSUB and variants with IF and ON. You can use a line number expression for these commands. This can help in program readability, allowing constructions such as GOTO KEY where KEY = 1000. This would transfer control to line 1000. RESTORE can also be followed by a line number expression. RESTORE KEY would cause the next READ to use the first DATA statement encountered at or after line 1000. This allows DATA statements to be selected under program control. Small files could be maintained in DATA statements and accessed by line number. When LISTING a program, the SHIFT key pauses the list until released. The ASC function will return a value of zero for null strings.

The new commands can be divided into five categories: sprite, sound, color control, VIC memory mapping, and graphics control. A convenience command [CATA is also included. This lists to the screen all mnemonics defined in SuperBASIC.

Loading The Program

To type in SuperBASIC 64 (Program 1), you must

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use the "MLX Machine Language Editor" program presented elsewhere in this issue. Be sure that you read the MLX article and understand how to use MLX before attempting to enter SuperBASIC.

The numbers you type in create a low memory loader for SuperBASIC which can be LOADED and RUN as if it were a BASIC program. Because the data for the SuperBASIC loader must go into the same area of memory where BASIC normally resides, a special tactic must be used to prevent the SuperBASIC data from overwriting MLX as it is entered. First, turn the computer off and back on to reset memory pointers to their normal values. Next, type in the following line in direct mode (without a line number) and hit RETURN:

```
POKE 44,22: POKE 642,22: POKE 5632,0: NEW
```

This moves up the start of the memory area used by BASIC so that all of the data for SuperBASIC will fit below MLX without interference. Now LOAD and RUN the MLX program in the normal manner. When MLX asks for the starting and ending addresses for SuperBASIC, give 2049 as the start and 5264 for the end. When you finish typing in the data for SuperBASIC, use the MLX Save command to store a copy of the SuperBASIC loader on disk or tape. If you do not type in all the data for SuperBASIC in one session, you must repeat the procedure for moving up the start of BASIC before loading MLX to complete your entry.

When you have a complete copy of the loader, you must reset memory to its normal conditions before LOADING and RUNNING SuperBASIC. You can do this by turning the computer off and back on, or with the command SYS 64738. When you RUN the SuperBASIC loader, it first copies BASIC from ROM into the underlying RAM and makes modifications to certain commands. Then it copies the machine language for the rest of the SuperBASIC routines into memory at \$C000 - \$CC00. No other machine language subroutines which use memory starting at \$C000 can be used with SuperBASIC 64, but the DOS Wedge program can be used without conflict. The loader erases itself from the BASIC memory area after it is RUN.

The SuperBASIC commands will be enabled until you hit RUN/STOP-RESTORE or POKE 1,55. Once loaded, SuperBASIC can be reenabled with POKE 1,54. The programs you write with SuperBASIC commands are loaded and saved in the normal manner. The only conflict with normal BASIC is the use of the STOP command. It is not available; use END instead. When SuperBASIC commands are listed while SuperBASIC is disabled, the [character will print as STOP.

Sprite Commands

[DSPR [MOVE [KSPR [ESPR [BSPP

These commands are used in defining sprite characteristics and controlling sprite movement. [DSPR (Define Sprite) is a general setup command that initializes a sprite for the VIC-II chip. The ten arguments in the parameter (see SuperBASIC commands at the end of the article) specify most of the options available for sprite control. [DSPR enables the selected sprite (numbered 0-7), stores block (blk) address in current screen pointer table, expands if xexp or yexp = 1, determines initial display position (xpos,ypos), and sets sprite color registers. Multicolored sprites are selected by setting multi = 1, single color by multi = 0. Mc0 and mc1 are optional arguments in the list which set up multicolor 0 and 1. [MOVE moves the selected sprite to xpos,ypos. Horizontal values greater than 255 are handled automatically. [KSPR and [ESPR kill or enable the selected sprite. [BSPP sets background/sprite priority for the selected sprite (sel = 1 sets background in front of sprite).

Sound Commands

[SSND [PLAY

These commands access some of the features of the SID chip. [SSND (Set up sound) produces a sound from one of the three voices of the SID chip. Voice (1-3) selects the voice, ad and sr control the attack/decay and sustain/release registers of the selected voice. Wave controls the waveform, gating, and special effects functions of the sound chip. Wave, ad, and sr use the same values that would normally be POKEd to these registers. Freq controls the frequency of the voice but is a 16-bit value in the range 0 - 65535. Pwidth is the pulsewidth value for the pulse waveform and is needed only when wave = 65. Pwidth is an 11-bit value in the range 0 - 12228. [SSND sets the volume register to 15. [PLAY is a short form of [SSND that assumes AD/SR values have been set previously. Waveform and voice values are coded into the first parameter argument by wave*256 + voice. Freq and pwidth are used the same as in [SSND.

VIC Color Control

[BKGD [BKG4 [EXTC [FCOL

These commands control background, border, and text character color. [BKGD sets the background to the selected color. [EXTC sets the exterior border color to the selected color. [BKG4 sets all four background color registers (used in extended color and multicolor bitmap modes). [FCOL (fill color memory) fills the color memory block with the selected color. This causes all text on the current screen to be displayed in the selected color. [FCOL is also useful in multicolor bitmap mode to set multicolor pixels.

VIC Memory Mapping

[BANK [VS1K [CB2K