

Concrete Turtling

by Joan Rainey

Whilst on leave in Boston for a year, I volunteered to teach Logo to a small group of students at the Lexington Montessori School. During that time, the importance of the concrete level of learning was impressed upon me anew.

The students ranged from grades 1 to 3, and had no previous Logo experience, and no typing ability. I chose as my basic objective to introduce the students to programming through the Logo language, within the intellectual and mathematical ability of each child.

After several experiments with groupings, I decided to concentrate on individual tutoring. The resulting months became one of the most challenging and fascinating educational experiences I have had in my entire teaching career.

As my knowledge of Logo was developing at the same time as that of the children, I learned with them, and from them. With my background in the use of the Baratta Lorton Method to introduce elementary mathematics, I became excited at the potential for curriculum enrichment as well as learning to program in this unique language.

I concentrated on three main areas of learning:

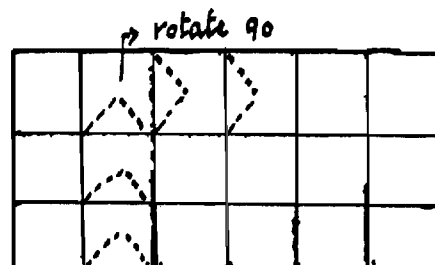
1. understanding the grid system
2. developing concepts of angles and sides in polygons
3. developing pattern block designs

In these areas, I made use of concrete materials, working at the concrete level before abstracting, writing programs on paper before reproducing them symbolically on the computer. This resulted in a three way process of concrete level - connecting level - symbolic level.

GRIDS

To facilitate the understanding of the grid system, I developed my own method, using the "Mathematics Their Way" concept of tiles. The children built their own grid system by setting out tiles on a table or floor.

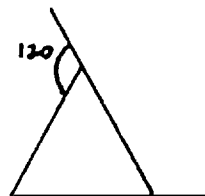
They plotted their own designs by using small triangles, which they placed on the tiles to show the path of the turtle. This aided their understanding of directionality, angles, and the number of steps FORWARD and BACK.



From this, the children were able to create designs, write the programs to produce them, and transfer them to the computer. The extra time taken at this stage with concrete materials promoted a greater understanding of the grid system and the concepts under investigation.

OUTSIDE ANGLES

In order to introduce and reinforce the more complex geometric concept of outside angles, I decided again to work first at the concrete level. Using the Montessori sticks and other materials, we explored shapes and angles, then inside and outside angles. By discussion and exploration, we found out how far the turtle would have to turn to change direction.

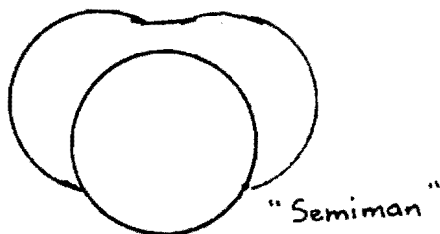


Concrete Turtling continued

A study of polygons followed. After drawing our shapes on the computer, we extended our knowledge by working out a procedure for each shape. Repeat designs were also introduced by changing the angle before drawing the shape again.

By now, the children could write complete programs for polygons, draw them on the computer, and then define a procedure for each shape. The procedures were used in extension activities.

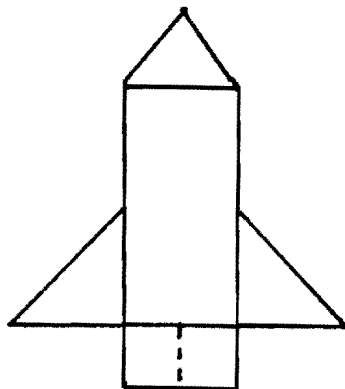
During this time, the concept of a circle being a many sided polygon was explored, first with the Montessori materials, and then with the computer. The importance of 360 was discovered and discussed. Strange circular creatures appeared on the computer screens.



PATTERN BLOCK DESIGNS

As reinforcement, pattern blocks were used to reproduce designs which were later transferred to the computer. I made a set of class cards for the children, incorporating the different shapes.

As a result, the children were making rocket ships, kites, and flowers out of a combination of shapes they had learned to draw. Modular thinking wasn't too far away.



IN SUM

I feel that the strategy of using concrete materials results in a greater understanding of the relationships and symbols. The children have an opportunity to do something, feel something, see and touch something. They have the opportunity to learn something other than by being shown.

Being able to express a relationship in terms with which they are familiar became less mysterious. Additionally, the concrete operations allowed children to be more involved in the process.

I had to continually remind myself, however, that each child is an individual, and has his own way of developing a learning style. Each child's mind and the "mind sized bites" will be based on that individuality. I believe concrete turtling promotes this process.

Joan Rainey has taught at the primary and junior level in Northern Ireland and Canada. She is teaching presently in Kingston, Ontario.

Infoworld Logo

"Where is Logo Taking our Kids?" is the cover story of Infoworld (January 23, 1984) by Scott Mays. He reports that Logo is taking the educational system by storm and may be poised to "replace BASIC as a language for first time users." Jim McCauley and John Allen are quoted on their perspectives about use of Logo and its future. Mays also talks about features available in new versions and includes a comparison chart.

The follow-up article by Barbara Wierzbicki in the same issue states, "The success of Logo hinges on teacher training." Logo is a new educational philosophy which challenges teachers to redefine their roles, according to Robert Taylor of Columbia Teachers College. Several other interviews emphasize the necessity of having teachers overcome their fear of the equipment and experience the joy of learning with Logo. The potential for Logo as a way of individualizing education is great, but teachers must be well trained in the philosophy as well as the mechanics of the language.

From The Editor

As I was reading recently, I came across the statement, "... and the Greek word KATALOGOS means to list." I thought to myself, "How fitting that a word containing 'Logo' also carries with it one of the major facets: lists!"

So often, what the public reads about Logo is a surface treatment. Articles containing information about turtle graphics abound. As a result, the popular conception has been formed that Logo is just a graphics language for young children.

Consider the following statement, taken from a report on a recent computer contest for teams of elementary school children. "We will probably never see entries submitted in Logo, since a team would have to be far more sophisticated with the Logo language than with BASIC to be able to solve the same problems."

As long as the list and computational sides of Logo are dismissed with such statements, I fear that Logo's potential for education may be misconstrued by those who make policy decisions.

We must make a concerted effort to inform our administrators, parents, and students that Logo is more than just a set of graphics commands. Unfortunately, that means we all must travel deeper into Logoland. We must be willing to grapple with the more difficult aspects of the language. We must help our students understand, appreciate, and benefit from the higher powers of Logo.

Newer Logo versions are becoming available for more powerful computers (such as the IBM PC), with capabilities of addressing large amounts of memory and performing mathematical calculations with up to 1000 significant figures and magnitudes up to ten to the 10,000th power! Additionally, file handling capabilities are improving rapidly.

With such changes coming, the training of teachers takes on an even more urgent priority. Although there will be a continuing need for beginner Logo classes, the training for more advanced uses of Logo in the classrooms should not be neglected.

If our educational systems can respond to this challenge successfully, then the full power of Logo can be effectively demonstrated to the public through the children themselves.

The suggestion made by an article in Time magazine that no one can get a job programming in Logo will soon be incorrect.

Until that time, FD 100!



Terrapin Announces Updated Logo for Apple Computers

Terrapin, Inc. has announced Version 2.0 of Terrapin Logo for Apple computers. The update adds 6 new primitives, including list operators COUNT, ITEM, EMPTY?, and MEMBER?. Several new file management and editor commands will also facilitate the advanced uses of the language. Recalling previous lines which include REPEAT using CONTROL-P is also a welcome improvement.

An especially helpful feature will be the ability to read program files created with LCSi's Apple Logo. This is a real advance for compatibility. Improved garbage collection capabilities will help with the limited workspace in the Apple memory.

An extensive chapter on "Words and Lists" has been produced as an addition to the documentation manual. Terrapin president J. Sheridan McClees said he is particularly pleased with the improvements made on the upper end of the language so that the advanced programmer will have many more possibilities.

The price for the complete new package will be \$149.95. Updates for owners of Version 1.0 cost \$20.00. The new "Words and Lists" chapter can be obtained for an additional \$5.00 for previous owners.

For more information, contact Terrapin Inc., 380 Green Street, Cambridge, MA 02139, (617) 492-8816.

As Easy As 1,2,3

A Review by

Pat Stevens

It is erroneously called "A Logo Fun-book for Kids." Donna Bearden's 1,2,3, My Computer and Me is for parents and teachers, too!

In this delightful book, the author draws upon her background of experience with the Young Peoples' Logo Association, and sets forth clear easy steps to learning how to tell the turtle what to do.

Young people of all ages will find how to test their hunches and explore mathematical ideas in a light hearted manner. Each chapter develops new concepts using discovery techniques. There are also a variety of related off computer activities, which we often find missing in other books.

Each step of the way, the author offers blank spaces for the student to fill in with results as new ideas are developed and explored. Instead of telling the reader that a right angle turn is 90 degrees, Bearden encourages a sequence of attempts to discover the relationship by trying different numbers and evaluating the results.

A typical page reads as follows:

"I tried these numbers:

— was too —
— was too — ..."

Additionally, the author is sensitive to anxiety due to having a different Logo version than the particular one used in the text. Throughout the book, she provides all commands for Apple, MIT, and TI Logo.

After my class had been introduced to the idea of a variable, we used the following procedure from the book to explore the angles for five sided figures.

```
TO PS :N  
  REPEAT 5 [FD 45 RT :N]  
END
```

As you can imagine, PS stands for pentagon, star. We started by trying to find the correct angle for the pentagon. We saw

that it was less than a right angle. As it became clear that 60 was too small and 80 was too large, the excitement mounted. Some tried 70, 71, 74, 73 ... when we found that 72 was perfect, the children exploded with delight!

In a similar manner, we found the turn of 144 for a star. The children were thrilled. From these beginnings, we went on to write our own procedures for pentagons and stars of all varieties. I appreciate a book which helps bring such excitement to my classroom.

At the end of each chapter, the author presents ideas for experimenting further. In some cases, drawings are offered, for which the student is invited to discover a procedure. Occasionally, a hint is given.

(I spent over an hour working on one for which no hint was provided. I'm not sure if I would have preferred a hint to position the turtle at a critical point, or if my feeling of success at the end was worth the frustration along the way.)

The book continues with more variables, recursion, and x-y coordinates. One of the later chapters deals with using colors. Information on saving procedures was a little too sparse for me.

Although the book is written for elementary school students, it can be a source of fun, interest, and learning for Logo beginners of any age from 2 to 102!

1,2,3, My Computer and Me is published by Reston Publishing Co., 11480 Sunset Hills Road, Reston, VA 22090, (703) 437-8900. \$10.95.

Pat Stevens is an elementary school teacher in Santa Fe, NM, and is actively involved in promoting the use of Logo throughout the southwest.

Logo on Sale

Oryx Systems is offering Krell Logo for \$75, Logo for the Apple II (Abelson) for \$15, and Terrapin Logo with full documentation for \$115, according to a recent advertisement. (800) 826-1589. Be sure this is the latest Terrapin Logo release, Version 2.0.

TIPPS for TEACHERS

by
Steve Tipps

Triangle Thinking: SIDE 2

Triangle thinking in last month's column concentrated on making and maneuvering triangles. The dependable equilateral triangle with inside angles of 60 degrees (and outside turns of 120) was used to make pyramids.

Then, an automatic triangle procedure based at HOME created any size right triangle, but it was always fixed at one corner. Finally, the discovery of the Pythagorean theorem presented as a Logo exploration enabled students to make isosceles triangles which could be moved anywhere on the screen.

Exploration of triangles in Logo continues this month with two very different kinds of problems. Filling triangles provides an open exploration with some surprising results. Creating a moveable right triangle points to learning about relationships between the three sides.

FILLING TRIANGLES: A TYPE I PROJECT

Drawing shapes is a beginning place in Turtle graphics, but outlining shapes are often inadequate for the needs of students' drawings. They often want filled in shapes: squares, triangles, and trapezoids. This desire is a marvelous basis for exploration of geometric properties of these shapes and creates a need for new or more refined Logo skills. Glen Bull and I call this a TYPE I project, in which children are initiators and the teacher is a facilitator.

Although the goal may be to fill a triangle, a filling strategy can be developed more easily for a square or rectangle at first. One way is to start one side, draw the base to the other side, turn 90, move up one or two lines, turn 90 again and draw back to the first side. Drawing this process first on paper with a magic marker will help determine the distance and directions of the move. The sequence is repeated until the box is filled.

```
TO FILL.TWO.LINES
  RIGHT 90
  FORWARD 50
  LEFT 90 FD 1 LEFT 90
  FORWARD 50
  RIGHT 90 FD 1
END
```

```
TO FILL.SQUARE
  REPEAT 25 [ FILL.TWO.LINES ]
END
```

This strategy is obviously less flexible than one using variables and is less elegant than one using recursion. The variable change is fairly straightforward.

```
TO FILL.TWO.LINES :SIDE
  RIGHT 90
  FORWARD :SIDE
  LEFT 90 FD 1 LEFT 90
  FORWARD :SIDE
  RIGHT 90 FD 1
END
```

```
TO FILL.SQUARE :SIDE
  REPEAT :SIDE/2 [FILL.TWO.LINES
:SIDE]
END
```

My first attempt at a recursive square follows. The logic was to use the side as the dimension to test and also as the variable to decrement in the recursive line.

```
TO RECURSIVE.FILL.SQUARE :SIDE
  TEST :SIDE <1
  IFTRUE STOP
  FILL.TWO.LINES :SIDE
  RECURSIVE.FILL.SQUARE :SIDE-2
END
```

When I tested this procedure, I was surprised (and delighted) to find a bug in my thinking. Instead of a filled square, I got a recursive fill triangle! Upon closer examination, I saw that the relative sizes of the sides can be controlled by the size of the decrement. A :SIDE-2 gives an equilateral triangle with two sides of size :SIDE. A :SIDE-1 gives a right triangle with one side twice as long as the other. A :SIDE-4 makes the ratio of the sides 4 : 1.

Since FILL.TWO.LINES fills two lines of the same length, the slope of the third side may not be accurate enough for you. But with a little finagling, FILL.TWO.LINES can be divided into two parts in which the return line length is reduced separately. That is

Tips continued

left as an exercise. However, the fortuitous RECURSIVE.FILL.TRIANGLE has left the problem of RECURSIVE.FILL.SQUARE unsolved.

Perhaps I needed a way to keep up with two different elements: the side of the square and the dimension to be decremented. With a square, the beginning size of both is the same, so I could use two different variables of equal size.

```
TO RECURSIVE.FILL.SQUARE :SIDE
:DUMMY.SIDE
  TEST :DUMMY.SIDE <1
  IFTRUE STOP
  FILL.TWO.LINES :SIDE
  RECURSIVE.FILL.SQUARE :SIDE
:DUMMY.SIDE-2
END
```

Try the following:

```
RECURSIVE.FILL.SQUARE 50 50
RECURSIVE.FILL.SQUARE 100 30
RECURSIVE.FILL.SQUARE 20 127
```

With :SIDE and :DUMMY.SIDE equal, I made a very adequate square. Then I tried other combinations and found that I had an all purpose rectangular filler. This led to a new procedure with two variables, :SIDE1 and :SIDE2.

```
TO RECURSIVE.FILL.FRAME :SIDE1 :SIDE2
  TEST :SIDE2 <1
  IFTRUE STOP
  FILL.TWO.LINES :SIDE1
  RECURSIVE.FILL.SQUARE :SIDE2-2
END
```

This family of filled-in shapes might be completed with a circle (See NLXual Challenges, elsewhere in this issue. Ed.), hexagon, trapezoid, etc. Developing the procedures is an excellent classroom project with many strategies possible.

WHY FIDDLE WITH FILLING?

Although the goal was to design a filled in triangle, the discussion of filling has not stayed specifically with triangular thinking. In such a TYPE I problem or project (See NLX, Dec 83 and Jan 84), many outcomes are possible. Although the original problem focused on triangles, the solution opened many other possibilities. The mistakes and side trips which I tried to report

were as valuable to me as the procedure RECURSIVE.FILL.TRIANGLE, the purported intention.

The description is not a lesson plan for filling shapes, but a preparation to help the teacher ask the right question or make the right suggestion. Working through the problem ahead of time for the teacher is like travelling the path to know what pitfalls and potholes may lie ahead.

In TYPE I problems, however, the teacher does not announce them all ahead of time. Students are free to fall in some of the same holes and get out by themselves. The teacher can move to prevent total discouragement and rejection of the problem. Working through the problem also gives the teachers an appreciation of learning from their own mistakes.

Open ended exploration of filling has several other aspects worth noting. First, filling can be done successfully at different levels of Logo skill. A square can be filled through the rather laborious job of programming each line separately. REPEAT is a "better" (more parsimonious) programming technique, and recursion is even more refined. However, at each level of skill, the description of what the turtle is to do is the same.

Filling provides a natural situation for enhancing Logo skills. I have found that filling has been the first project in Logo which many students encounter that cries out for recursion. While recursion certainly can be "taught," Logo teachers look for situations in which needs for skills are almost spontaneous. Filling seems to be one of those situations.

FILLING DIFFICULTIES

There are problems with filling. When filled shapes on the screen overlap, distortion is frequent. Picture elements tend to capture each other and change their colors. This is a particular problem when drawing off axis.

Second, stopping in the middle of a project which demands a fill to do this exploration is a problem for some students. They may become discouraged when they are intent on one project and have a big delay to work out how to fill an area. Many would rather have the "right" procedure handed to them than find out how it actually works.

more Tipps

The teacher has to strike a balance of helping projects along and helping children understand how procedures work so that students can make them work. Sharon Burrowes makes that point well in her article "The Hazards of Hacking," in last month's NLX.

Finally, there are other ways of filling: light pens, Koala pads, or the FILL command in IBM Logo. The question is whether the students should use these other techniques or whether they should go through the process of finding out how they can do the same thing for themselves.

When the other techniques are widely available, FILL may become a purely academic exercise which no longer has a natural place; but if that comes to pass, I will mourn its loss as a stimulating TYPE I problem.

THE RIGHT TRIANGLES MOVE AWAY FROM HOME: A TYPE III PROBLEM

A different approach to learning with Logo is a TYPE III problem, characterized by the teacher with the intention of using Logo to explore content. The goal is not Logo per se, although a lot of Logo is learned in the process. Instead, the goal is to discover ideas using Logo.

One such problem would be an extension of the triangular thinking presented in last month's column. The AUTO.TRIANGLE procedure draws any right triangle, using HOME as a starting and stopping place. This anchor allowed students to discover the relationships between the two given legs and the length of the hypotenuse, using the Pythagorean theorem. In that respect, the column last month was a TYPE III problem solution.

The purpose of the problem is to discover the relationships among the three sides. Those of us who have forgotten, (or never understood) the definition of sine, cosine, and arctangent are in for a refresher course in trigonometry.

This month, the problem is set up for analysis. I invite you and your students to embark on the problem to see what pitfalls and potholes you discover. The estimated level of the problem would be seventh-eighth grade through college and adult.

HOW ARE WE RELATED?

Conversation between three sides of a right triangle:

SIDE1 to SIDE2: Let's get together and tell SIDE3 how big to be.

SIDE2 to SIDE1: That's right, mate. If I make a square and you make a square, the sum of squares determines how big SIDE3 is going to be. (That is, if SIDE3 is smart enough to take the square root.) We make a pretty good team.

SIDE3: Hold on one minute. You are forgetting about our angles. I can work with either of you two sides to figure out what size our angles are. I think if we get that straight, we can all move away from HOME. I'd really like to run away from HOME and draw on the left side.

SIDE2: I've been wanting to go South of HOME. I bet when you can add us together, or maybe multiply or divide us, something interesting happens.

SIDE1: I'll bet our squares are important. Maybe we are all cousins.

SIDE3: We may have to try out many different things to figure out how we are related. Let's change our lengths and do a lot of calculations to see what we can find out.

GOAL: To derive the relationships between length of sides and the angles in right triangles of any size.

SITUATION: AUTO.TRIANGLE can be used to generate triangles of any size using HOME as an anchoring spot. However, these triangles cannot be transported around the screen to use in other ways. If a relationship between the sides and angles could be found, a generalized procedure for ANY.TRIANGLE could be written with inputs of :SIDE1 and :SIDE2.

HINTS: The Pythagorean theorem is needed to determine the size of :SIDE3. Students should be able to use Logo to figure :SIDE3 and to construct 45 - degree isosceles triangles of any size. (See "Tipps for Teachers", Triangle Thinking: Side 1, NLX, Jan 84.)

Tipps . . .

HEADING, SETHEADING, and SETHEADING TOWARDS is useful for finding out what direction the turtle is pointing. The Total Turtle Trip Theorem can be used to change headings into degrees. PRINT out the amount of the turns and the length of the sides to help see the relationships.

PROGRAM STUB:

```
PRINT HEADING - 90
PRINT 360 - 90 - (HEADING - 90)
or
PRINT 360 - HEADING
```

RESULT: ANY.RT.TRIANGLE :SIDE1 :SIDE2 could be drawn at any place and any orientation on the screen.

This is an attempt to model a TYPE III problem. Your comments and solutions, alternatives and refinements, are invited. Some possible solutions will be discussed next month.

Steve Tipps is a professor in the University of Virginia's School of Education, and presents Logo workshops for school systems throughout the United States.

Have A Logo Summer

Dan and Molly Watt, and Tony Stavely will host The Logo Institute at Keene State College, July 30 through August 17. It promises to be an outstanding program, with many different activities planned. Included will be courses on Logo philosophy, list processing tools, and interactive programming. For more information, contact Dr. Howard Croteau, Director of Continuing Education, Keene State College, Keene, NH 03431, or call (603) 352-1909.

Michigan State University will offer a seminar on Logo research and educational applications, beginning June 20. Students will survey the theoretical models and educational applications of Logo, and become familiar with data processing aspects of the language for three hours of graduate credit. For more information, contact Dr. Lawrence T. Alexander, CEPSE, Michigan State University, East Lansing, MI 48824-1034.

The Department of Artificial Intelligence of the University of Edinburgh will teach both an elementary and an advanced Logo course this summer, beginning in mid-August. The elementary course has no prerequisites, while the advanced course requires at least one year of Logo experience. Advanced topics include list processing and using Logo in language teaching. The cost will be approximately \$200. For more information, write K. R. Johnson, Department of Artificial Intelligence, Forrest Hill, Edinburgh, Scotland EH1 2Q1, or telephone 031-667 1011, extension 2497. Please enclose an international air mail postal coupon with your inquiry.

Fresno Pacific College's immensely successful Summer Computer Institutes will be offered again, beginning in June. Arthur Wiebe, program director, reports that Logo became the language among the more than 500 attendees last summer. This year, each institute will have 6 laboratories, with 20 computers in each. A minimum of 50 hours of hands-on instruction is scheduled for each participant, for 4 hours of graduate credit. The fee is \$350. Early reservations are encouraged, because space is limited in this popular offering. For more detailed information, write to Dr. Arthur Wiebe, Division of Education, Fresno Pacific College, 1717 South Chestnut Avenue, Fresno, CA 93702, (209) 251-7194.

If you have been looking for a Logo course to help you integrate the language into your regular curriculum, then consider a summer course offered by the University of Maine. "The Computer and the Curriculum: Learning with Logo," is designed for elementary and middle school teachers, administrators, and curriculum developers and will include both Logo study and Logo use in curriculum areas such as reading, mathematics, social studies, and science. No previous computer experience is necessary. Three credit hours are offered to students completing the course. For more information, write Dr. John W. Butzow, Department of Education, University of Maine, Orono, ME 04469, or call (207) 581-2434.

A workshop for Logo beginners will be offered by Jim Fejfar in Lincoln, NE, May 21 to June 8. Hands-on Logo work will be emphasized. Enrollment is limited. Write to Dr. Jim Fejfar, 214C Henzlik Hall, Lincoln, NE, 68588-0355.

MICROWORLDS

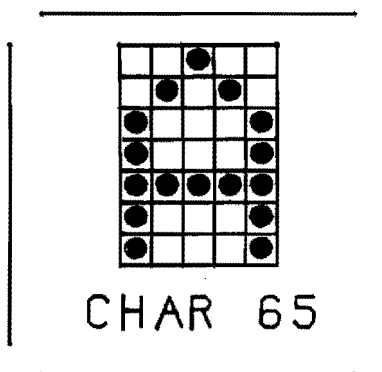
by
Glen Bull

Logo Characters

The TI 99/4 was the first computer with Logo to which I had access. It had an abysmal keyboard, but it also possessed a 16-bit microprocessor and a powerful Texas Instruments graphics chip.

TILES AND CHARACTERS

Tiles were a prominent feature of TI Logo. A tile consisted of a grid of squares which could be darkened to form shapes. TI Logo provided a set of ready-made shapes, which included the alphabet. For example, an "A" might be formed from a five-by-seven matrix of darkened squares.



The alphabetic characters produced by most computers are formed similarly by dots in a grid. If you have a monochrome monitor (rather than a television screen) it may be possible to see the individual squares which form the letters.

The characters of the TI alphabet could be altered by changing the pattern on the tile. Foreign alphabetic symbols could be substituted for the English alphabet, for example. The recently released IBM Logo has similar capabilities.

I am currently working on a Logo program to produce tiles on the IBM Personal Computer similar to the ones which I first encountered on the Texas Instruments micro-computer.

The letter "A" in TI Logo is on tile 65, the letter "B" is on tile 66, etc. Tiles are not available in all versions of Logo. Most versions of Logo do number the letters on the alphabet in the same way, however. The chances are that if you type

```
PRINT CHAR 65
```

the character "A" will appear on the screen. What number would you use to produce the character "D"?

USES FOR THE COMMAND CHAR

The command CHAR is a primitive, or built-in command, in most versions of Logo. Why would you type PRINT CHAR 65? Why not simply type PRINT [A]? The command CHAR can be used to print the alphabet. (In the LCS version, substitute the word TYPE for the word PRINT1.)

```
TO ALPHABET
  MAKE "NUMBER 65
  REPEAT 26 [ PRINT1 CHAR :NUMBER MAKE
"NUMBER :NUMBER + 1 ]
END
```

The following Logo procedure allows the characters between any two CHAR numbers to be printed.

```
TO SYMBOLS :START :END
  IF :START > :END PRINT [ ] STOP
  PRINT1 CHAR :START
  SYMBOLS :START + 1 :END
END
```

In the LCS variant, TYPE must be substituted for PRINT1, and brackets must enclose the second half of the first line.

```
TO SYMBOLS :START :END
  IF :START > :END [ PRINT [ ] STOP ]
  TYPE CHAR :START
  SYMBOLS :START + 1 :END
END
```

To illustrate the use of this program, SYMBOLS 58 62 will print these symbols:

: ; < = >

The instruction SYMBOLS 65 90 prints the alphabet. The instruction SYMBOLS 97 122 appears to do the same thing. However, if the output is sent to a printer rather than the monitor screen, the characters between

Microworlds continued

65 and 90 print in upper case, but the characters between 97 and 122 are printed in lower case!

```
SYMBOLS 65 90
ABCDEFGHIJKLMNPOQRSTUVWXYZ
SYMBOLS 97 122
abcdefghijklmnopqrstuvwxyz
```

Can you write a procedure that will convert upper case letters to lower case letters when they are sent to the printer?

NON-PRINTING CHARACTERS

Typing PRINT CHAR 33 causes an exclamation mark to appear on the screen. Almost any other number after the command CHAR will also cause a letter or punctuation mark to appear on the screen. However, not all do. Typing

```
PRINT CHAR 7
```

produces a beep instead of a character on the screen. Character 7 is a non-printing character. It produces a noise instead of a letter.

Thirty-two is another number which does not produce a letter or punctuation mark on the screen. It produces a space. This character had been used frequently in past NLX columns in instructions such as

```
PRINT1 CHAR 32
or, TYPE CHAR 32
```

WHICH KEYS HAVE WHICH NUMBERS?

Earlier, the question was posed, "What number is associated with the character D?" Since an A is CHAR 65 and B is CHAR 66, then C is CHAR 67 and D must be CHAR 68. What number is associated with the character L? Counting down the alphabet takes too long, but there is an easier way. Typing

```
PRINT ASCII "L
```

yields the result 76. The word ASCII is a special Logo command which is used to determine the character number of any letter. To verify this, type

```
PRINT ASCII "A
```

and the now familiar 65 appears.

Some of the keys on the keyboard do not have letters or numbers on them. The arrow keys are an example of this type of key. However, these keys do have character numbers associated with them. A one-line program can be used to find out the numbers associated with keys on the keyboard.

```
TO KEY.NUMBER?
  PRINT ASCII READCHAR
  KEY.NUMBER?
END
```

When a key is pressed, its corresponding CHAR number appears on the screen. This program can be used to determine that a left arrow is CHAR 8, and a right arrow is CHAR 21. What CHAR number is associated with the key labeled ESC?

This knowledge can be used in construction of Instant Turtle programs of the type mentioned in the December NLX. (See "Tips for Teachers, The Issue of Instant") Instant Turtle programs use single key commands to drive the turtle around the screen. They may take the form:

```
TO INSTANT
  MAKE "COMMAND READCHAR
  IF :COMMAND = "F FORWARD 25
  IF :COMMAND = "B BACK 25
  INSTANT
END
```

This INSTANT program can be extended to include commands such as IF :COMMAND = "R RIGHT 90. The ASCII command can as easily be employed to use the arrow keys to turn the turtle left (CHAR 8) and right (CHAR 21). (In the LCS version, instructions such as FORWARD 25 are enclosed in brackets to form a list: IF :COMMAND = "F [FORWARD 25].)

```
TO INSTANT
  MAKE "COMMAND READCHAR
  IF :COMMAND = "F FORWARD 25
  IF :COMMAND = "B BACK 25
  IF ASCII :COMMAND = 8 LEFT 30
  IF ASCII :COMMAND = 21 RIGHT 30
  INSTANT
END
```

The KEY.NUMBER? program can also be used to identify control characters. For example, if you hold down the key labeled "CONTROL" and press the key "A", the CHAR number 1 appears on the screen. CONTROL-H is CHAR 8, and CONTROL-U is CHAR 21. The left arrow is also CHAR 8, while the right arrow is CHAR 21.

more Microworlds

The Apple IIe has a good keyboard which is a pleasure to type on, but the arrow keys are inaccessibly placed on the bottom row beside the space bar. While using the Logo editor, I avoid the problem by pressing a CONTROL-H instead of a left arrow to move the cursor left, and a CONTROL-U instead of a right arrow to move the cursor right.

THE AMERICAN STANDARD CODE

Many languages on both personal computers and mainframe computers use a standard code to store information. In this code, CHAR 7 is a beep, CHAR 8 is a backspace, and CHAR 65 is the letter "A". This code is known as the American Standard Code for Information Interchange.

Since that is a rather long phrase, the term is frequently called by its initials, ASCII. The term "Information Interchange" refers to the exchange of information between two computers, or between two programs in the same computer. For example, a word processor on the Apple which stores its information in the form of ASCII code might be used to write parts of adventure stories which would later be incorporated into Logo programs without retyping them.

The ASCII code is encountered in many places in computing. In AppleSoft BASIC the command

```
PRINT ASC ("A")
```

is the equivalent of the command PRINT ASCII "A" in Logo. In the same way, the AppleSoft BASIC command

```
PRINT CHR$ (65)
```

is the equivalent of PRINT CHAR 65 in Logo. These commands are used frequently in BASIC. Recognition of them may make it easier to translate an interesting program from BASIC to Logo.

CODES STANDARD AND NON-STANDARD

Other codes besides the American Standard Code exist. In the past, a code known as Baudot, named after its French inventor, has been used to transmit information between telegraph stations. Baudot Code is still utilized by many deaf individuals who employ teletype equipment to send information to one another over the phone lines.

Another code which is primarily found on IBM mainframe computers, and rarely encountered on personal computers, is EBCDIC. That stands for "Extended Binary Coded Decimal Interchange Code."

Some languages and programs on personal computers do not use American Standard Code. For example, some (but not all) word processors on the Apple use non-ASCII codes in order to make more efficient use of memory. This is an advantage if the program is only to be used by itself, but is a nuisance if it is necessary to share information with other programs. Often, utility programs are provided to covert non-standard information to American Standard Code, but these utilities do not always work perfectly.

CONTROL CHARACTERS

In the American Standard character set, the characters between 32 and 127 are printing characters. Thus, there are 95 printing characters in the standard character set. The characters below 32 are non-printing characters.

If you have a printer, direct the output from the keyboard to it by typing

```
OUTDEV 1 (in Terrapin Logo)
or .PRINTER 1 (in LCSi Logo)
```

Then type the following:

```
PRINT CHAR 12 (in Terrapin Logo)
or TYPE CHAR 12 (in LCSi Logo)
```

There is a fair to good chance that your printer will eject a page from the printer. In business jargon, this is known as a form feed, because it feeds business forms such as checks and invoices through the printer. On some printers the button which moves the paper up one page is labeled "FF".

The non-printing ASCII characters between 0 and 32 are sometimes called control characters, because they are generated by holding down the key labeled CONTROL at the same time a letter is pressed. For example, a CONTROL-H generates a CHAR 8, which results in a backspace on computers which use the standard code for backspacing.

Another reason that these non-printing codes are called control characters is because they are often used to control

Microworlds . . .

devices such as printers. That is why CHAR 12 will generate a from feed on most (but not all) printers. Unfortunately, the ASCII code was developed long before the current generation of printers was developed. Thus, printers with features such as compressed mode, or a double-width mode, or a boldface mode were not envisioned. Consequently, each manufacturer has tended to develop its own control codes for its printers.

Fortunately, it is possible to look in the printer manual and identify the control codes for a particular printer. For example, there are more Epson printers than any other brand of printer. The code for compressed print of 132 characters per line (rather than the standard 80) on the Epson MX-80 printer is CHAR 15. The code for turning off the compressed print is CHAR 18. If you have an Epson MX-80 printer, try sending the following program to the printer.

```
TO DEMO
  PRINT CHAR 15
  PRINT [ THIS IS IN THE COMPRESSED
MODE.]
  PRINT CHAR 18
  PRINT [THIS IS NORMAL PRINT.]
END
```

If you have another brand, examine the manual to identify the control codes which operate the features of your printer. There is a hardware company which manufactures a row of buttons which can be attached to a printer to control the various printing features. As I recall, the retail price of the device is about \$60. You should be able to achieve the same result with a two-line Logo program, and save \$60.

PRINTING REPORTS

In last month's NLX, I described a method for printing the text of a procedure. I developed the method for printing Logo adventure stories, but suggested it might also be used to print letters to parents and end-of-school-year reports. In next month's NLX, I will examine how control characters in these reports can be used to underline text, high-light figures, and enhance the text in other ways.

Glen Bull is a professor in the University of Virginia's School of Education, and teaches Logo courses at both the graduate and undergraduate level.

Right Here In Turtle City

by Steve Tippy

"Trouble in Logoland" is the title of Mary Cron's article in the December 1983 issues of TLC magazine. The title is misleading in that the article is a well reasoned discussion of the results from the Bank Street and University of Haifa studies.

The results of these studies appear to refute claims about Logo made by Papert. Complex ideas in Logo did not transfer into other situations or to other types of problems, according to the researchers. In addition, knowledge about Logo programming was not as high as the researchers expected.

According to Cron, the results of these studies were predictable from the instructional methods used. The researchers set up non-directive learning situations in which teacher intervention was minimal. She feels that this method is not appropriate for Logo, preferring instead, Guided Discovery. In this method, the teacher is a resource who has both directive and facilitative roles.

LOGO GUIDANCE

My Logo experience and that of others (see "The Hazards of Hacking" by Sharon Burrowes, January 1984 NLX) coincides with Cron's. The students who make the most progress with Logo have teachers who are willing to step in to prevent discouragement and to uphold standards.

Students do not spontaneously generate procedural problem solving, recursion, variables, or list processing. What they do generate are situations in which these concepts would be useful. A developmental approach grows with their needs rather than leaving them to their own devices. Students do not always know when to ask for help.

Guided Discovery as the needed approach will not come as news to any one who has been involved in other active learning programs: kindergarten, mathematics and science laboratories, Elementary Science Study,

Turtle City continued

Science Curriculum Improvement Study, Minnemast, Outdoor Biological Instructional Strategies, Language Experience Approach to Reading, Independent Reading Programs, Gifted and Talented Programs (Treffinger or Renzulli models), Moffett's Interact Language program, Graves' writing programs, ad infinitum. Guided Discovery has been the recommended instructional strategy for the last twenty years, but still has not become the prevalent teaching method.

There is a good reason for our practice to fail our preaching. Guided Discovery teaching is the most difficult of all teaching strategies. It requires teachers who are well grounded in the "content" being covered, and who understand that instructional objectives may be attained in many ways. It takes teachers who are self assured about when to remain quiet and when to intervene, and who are willing to allow themselves and students to make mistakes in the pursuit of knowledge.

These teachers have two ultimate goals for students: success and independence. The method is linked directly to the goals.

LOGO TRANSFER

Mary Cron is not surprised that non-directed teaching resulted in no overwhelming knowledge about Logo or transfer of problem solving skills. Laissez faire, non-directed teaching mimics guided discovery teaching, but it is not the same at all. The laissez faire teacher has little direction and gives little direction.

Many people wrongly believed that totally non-directed teaching was the basis of the open classroom. However, good informal classrooms were always structured learning environments with provision for individual learning needs.

The demise of the movement towards open classrooms occurred not because they did not work, but because they were too much work. Only places which were willing to provide constant leadership and training have sustained informal learning situations. The informal classes in Upper Arlington, Ohio, and Drew Model School in Alexandria, Virginia, are examples.

In the world of educational research, generalization of learning from Logo to other situations would have been miraculous rather than inevitable. Transfer of learning is a rare finding. Even had the methodology been closer to Guided Discovery than non-directed, I wonder if the results would have been different.

Perhaps the claims for Logo have been too high and too idealistic, as Cron suggests. Or, perhaps the way we generally evaluate learning with group norms and standard deviations is not appropriate for the kind of highly individual learning which goes on with Logo.

LOGO TESTS

The low scores on a paper and pencil test at Bank Street were similar to the results of a paper and pencil test we tried out last year at the University of Virginia. However, even students who did poorly on the quiz had a wide range of skills on the computer.

Richard Noss, director of the Chiltern Logo Project in Hatfield, England, expressed amazement at the way educational research is conducted in the United States. Giving a paper and pencil test on Logo skills seems to him, and to me, quite similar to giving a paper and pencil test on riding a bicycle. The Bank Street conclusion was that children did not learn much Logo; our conclusion was that the evaluation technique we used was inappropriate.

In addition, many of the ideas beyond turtling in Logo depend heavily on abstract reasoning. Although children can manipulate ideas such as variables and recursion at a concrete level (see Joan Rainey's article elsewhere in this issue), they understand them only in terms of tangible effects. Many problems depend on abstract manipulation of ideas such as variables, combinations, permutations, correlations. These relational ideas do not develop quickly.

Seymour Papert suggests that work with Logo will speed this intellectual development. I don't believe that two years of Logo will overcome eons of human development. I do believe that Logo provides a new environment in which learners (of all ages) can play and manipulate ideas in a way never available to them before.

Turtle City continued

As a result of this play, the advent of abstract reasoning may be considerably eased. If Logo has impact on these formal thinking abilities, the differences will be measured in days and weeks, not in years.

SHOW ME

A frequent query I receive is, "Show me studies which prove Logo teaches problem solving, mathematics, language arts, etc." I reply, "Show me studies which prove math books teach mathematics, pencils teach social studies, overhead projectors teach reading." The standards to which Logo is held seem different from those expected of other instructional materials.

People prefer a quick fix to problems. But neither Logo nor computers in general are likely to solve educational problems just through their existence. They are tools which may help in solutions.

Tools require competent users. Computers do not replace teachers or diminish their importance. More highly qualified teachers are needed to structure learning with the computer as another instructional tool. Dave Morsund's editorial in The Computing Teacher's special issue on Logo says it well:

"Attracting and holding good teachers, providing them with high quality preservice and inservice education, supporting them with appropriate resources--these are keys to improving our educational system. I believe in the potential of Logo, but I believe much more strongly in the part educators will play in its effective use."

WHAT TO DO?

The effects of Logo should be examined in more detail. Studies of limited scope, with appropriate guided discovery teaching, are needed. The aim would not be to defend Logo, but to determine how Logo can best be used. Only in such situations can we find out what Logo does for learners.

Mixed research designs with anecdotal case study material need to be balanced with more objective measures. But, failure to winnow robust statistical results does not invalidate the goals or methods of Logo.

We must be careful when listening to the likes of Professor Harold Hills (Music Man) proclaiming that we have "trouble in Turtle City." Our trouble is that we don't have enough good programs and experience to know how Logo works best.

Papert raises our eyes to the stars, but does not provide many hints about how to get there. The task of working with Logo is left to mortals who have much to learn.

Steve Tipps is a regular columnist for The National Logo Exchange, and frequently contributes additional articles.

Logo In The News

inCider magazine for January 1984 features an article by Molly Watt which chronicles the adventures of Joey's drawing with Logo. In "Logo Building Blocks," she tells how Logo responds to Joey's needs and questions as he makes more elaborate designs. Teachers will find encouragement in the way Logo (and the sensitive Logo teacher) allow children to find their own directions in the Logo environment.

This article is one of a series of four related to Logo which will appear in inCider in the coming months. February's article will feature debugging, March's will make a comment on "no threshold, no ceiling," and the one in April will tell about computer cultures. Be watching for them.

Molly would appreciate any comments from NLX readers. Send them to her at Educational Alternatives, Gregg Lake Road, Antrim, NH 03440.

A+ magazine (December, 1983) has an article called "Follow the Turtle to Logo" by Steve Rosenthal. The article reviews most of the fundamental commands of turtle graphics, discusses some of the structural issues of Logo, but makes only a short mention of words and lists. The sidebars on the article mention some of the antecedents to Logo and the Apple Toolkit.

Logo News

Eric Sandberg-Diment writes about "Logo, The Friendliest Language," in November 1983 Science Digest. A quotable quote: "What makes Logo such a good first language is its forthrightness. The language doesn't get in the way of what you are trying to do."

"The Very Thought of Turtles" is reprinted in Readers Digest January, 1984 from Yankee magazine. Although not about Logo, this personal story of box turtles and their behavior might lead to your Logo students becoming more interested in studying "real turtles." Sounds like a dynamite name for a television series!

A 100 page Logo magazine arrived at NLX from Japan. The publication is written by an active Logo user's group in Japan and is called Logo Some Z's. The issue is entirely in Japanese except for an occasional English word and Logo commands.

The magazine looks fascinating, and includes an article on playing a flute and reviews of several different Logo versions (Epson, and others), books (Learning with Logo and Turtle Sourcebook), and other Logo materials.

A chart on the inside cover features a genealogical tree of Logo, with its roots in artificial intelligence. According to the outermost branches, there are many versions of Logo being developed in Japan.

For more information, contact Setsuko Abe, Geodesic Inc., 401 Park Heights, 1091 Kumagawa, Fussa-shi, Tokyo, Japan.

Edward H. Dougherty invites all Logo students and teachers to submit their favorite procedures for publication in a new book he is writing about learning Logo. He is especially interested in projects which include comments and stories by students telling about the development of the procedures. For more information, write to Edward at 1501 Presidential Way, Suite #16, West Palm Beach, FL 33401, or call (305) 684-4770. You may also leave an email message on CompuServe for 74216,3236.

A report on True BASIC being developed by John Kemeny and Thomas Kurtz (the originators of BASIC) in Infoworld (January 16, 1984) claims that it will possess "graphics capabilities which surpass those of Logo." What about those words and lists and recursion and ...

The move to develop software with Logo or to be Logo-like goes on. Carousel Software announces three new programs - Telly Turtle, Brain Strainers, and Simulated Computers - which they say are based on the Logo language. (Infoworld, December 26/January 2, 1984, p. 43.)

COMPU-LIT (PO Box 254, Sherborn, MA 01770) has already released Logo Locomotion and Ticktock which were developed with Logo. An unpublished review of these two programs by Tom Muncy of Waynesboro, VA, points to some potential problems. Ticktock was extremely slow in operation (50 - 90 seconds per clock face). Use of PICTs would have speeded this up considerably. The skills presented in Logo Logomotion rely on coordinate geometry and are not as "intuitive" as the more typical Logo sequence. The reading level of the instructions was fairly high (7th grade, Fry) for a program which would be intended for introduction of turtle graphics.

Development of instructional design for CAI with Logo is certainly possible. Implementation of commercial CAI with Logo may not be as feasible.

Dave Boyd, of Synetix Inc., wants to inform all NLX subscribers that the Terrapin sprite drivers now available from Terrapin Inc., 380 Green Street, Cambridge, MA 02139, for \$30, will support their series of sprite boards, if they are plugged into Apple slot # 4 instead of # 7, as suggested in their documentation. Prices for the sprite boards range from \$149 to \$395. For more information, write Synetix Inc., 10635 NE 38th Place, Kirkland, WA 98033, or call (800) 426-7412.

NLXual Challenges

with Robs Muir

This month's problem is a special challenge. First, let us create a problem which uses a circle of some known circumference. For example, we can draw a circle with the familiar statement REPEAT 360 [FD 1 RT 1].

If you remember your geometry, you may (?) recall that the circumference is equal to the diameter times pi, or $C = D * \pi$. This formula can be rewritten to include the radius, rather than the diameter. Since the radius of any circle is twice the diameter, our formula becomes $C = 2 * R * \pi$. All we need now is the value for pi and we are ready to proceed.

If you attempted the problem of last month (the circle in a box), you probably encountered the value of pi. Most of the solutions submitted used some variation of pi, the number 3.14159.

Indeed, I received an excited late night call from a colleague who had experientially derived pi in the course of solving this problem. He kept coming up with a value approximating 3.14159, when, suddenly, he made the connection! My skeptical friend, who holds a PhD in education, finally was convinced that Papert's vision of discovery based learning in computational environments works. Another convert!

Armed with an understanding of the relationships among the circumference, diameter, and radius of a circle, you should be ready to tackle the next problem. Draw our circle of REPEAT 360 [FD 1 RT 1] and fill it in.

There are many possible ways to accomplish this; some are efficient, some not so. Perhaps we should define efficiency in terms of speed. Here is a very inefficient method.

```
TO FILCIRC :SIZE
  REPEAT 360 [TRI :SIZE RT 1]
END
```

```
TO TRI :SIZE
  REPEAT 3 [FD :SIZE RT 120]
END
```

Can you write a FILCIRC procedure that will fill in a circle of any size? How fast will your method fill a circle with a diameter of 114.592 (360/3.14159) turtle steps?



During my attempts at a satisfying (and efficient) solution, I used several different approaches. With Terrapin Logo, my fastest method filled in our "standard" circle in 40.2 seconds. The identical method in Apple (LCSI) Logo required 58.2 seconds! Can you fill in the NLX circle faster?

Note: As with all NLXual Challenges, if you want to receive a possible solution, send a copy of your solution (or your attempt) with a stamped self addressed envelope to NLXual Challenges, Attn: Robs Muir, 1688 Denver Avenue, Claremont, CA 91711. We will compile contributions and send you the most elegant solution.

If you have an idea which might be developed into a challenge for this column, send it to me at the above address. Thanks!

Robs Muir is a teacher in the Claremont CA Unified School District and Claremont Graduate School. He presents Logo workshops in the southern California area.

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Editor.....Tom Lough

NLXTRA

Logo Notes

Logo Hawaiian this summer! Steve Tipps, Glen Bull, and Tom Lough will present a graduate level course entitled, "Logo in the Classroom," to be taught at Punahou School in Honolulu, Hawaii, July 23 to August 3. The three credit hour course is offered through the University of Virginia School of Education's Division of Continuing Education. The course includes hands on Logo instruction, advanced uses of Logo, and observation of Punahou students working with Logo.

Information on both the course and the travel arrangements is being coordinated by Sylvia Corwin. Call her at (800) 223-2544 (in New York, (212) 557-4746), or write Educational Spectrum, Inc., 331 Madison Avenue, Suite 801, New York, NY 10017.

Interested in Logo on time sharing computers? Charles Tidball and a group from The George Washington University in Washington, DC, have written two versions of Logo, one to run under UnifLEX on an SWTP microcomputer (S/O9 or St), and the other under RSTS/E on a DEC PDP-11. The DEC version uses ReGIS graphics and supports color, but requires either a DEC GIGI keyboard or a DEC VT-125 terminal.

For more information, write Professor Charles S. Tidball, Director, Educational Computing Technology Program, Department of Education, The George Washington University, Washington, DC, 20052, or call (202) 676-8616.

The Educational Computer Consortium of Ohio (ECCO) announces a series of Saturday morning Logo workshops, beginning February 4 and continuing through March 17. Each workshop will include an introduction, sharing Logo with children, and suggestions on how to use Logo in discovery learning. For more information, write ECCO, 4777 Farnhurst Road, Lyndhurst, OH 44124

Griff Wigley of Northfield, MN, sends this teaser. Try it yourself.

```
MAKE "X 1.25 + 2.75
PRINT :X
PRINT INT :X
```

(Some Logo versions use the INTEGER command instead.)

Now try this.

```
MAKE "X 1.45 + 2.55
PRINT :X
PRINT INT :X
```

Such roundoff behavior is not uncommon in computers. It is surprising that it appears here with so few significant digits, however.

CLOSING THE GAP, a newspaper dedicated to helping the handicapped take advantage of the potential of computers, announces a national conference on the use of microcomputers and technology for the handicapped. The conference will be in Minneapolis, September 13-16, and is sponsored by CLOSING THE GAP and Johns Hopkins University. Several Logo activities are planned. For additional information, contact Paula Barnhart, Conference Manager, PO Box 68, Henderson, MN, or call (612) 665-6573/8299.

A conference entitled "Microcomputers Within Indian Education" will be held February 28 - March 1 in Reno, Nevada. Carolyn L. Granados, educational consultant, reports that they will be having workshops on Logo projects which were used successfully with American Indians at computer day camps last summer. The conference is sponsored by American Indian Systems Co., Inc., PO Box 214844, Sacramento CA 95821.

The Learning Exchange of Kansas City, MO, announces the formation of a 2-hour graduate credit Logo class, to be taught this summer. For more information, contact Rosanne Stoneking, The Learning Exchange, 2720 Walnut, Kansas City, MO 64108, (816) 471-0455.

NLX subscriber Roger Kirchner has developed a TI Logo II Christmas tree similar to the one offered in December's NLXtra. For a free copy of the listing, send a stamped self addressed envelope to Roger Kirchner, Carlton College Department of Mathematics, Goodsell Observatory, Northfield, MN 55057. (Don't wait until next December!)

Evelyn Dale sent us a cute wooden turtle for Christmas. It is about the size of an English walnut, has movable legs, head, and tail, and is mounted on a magnet. Ray Steele, of the Gourmet Connection, 1766 East 8th Street, Davis, CA 95616, (916) 756-6337, sells them for \$1.29 each, and will give a better price for large orders. California residents, please enclose state sales tax.

The Young Peoples' Logo Association's electronic bulletin board is operational. Featuring The Midnight Turtle, it is on line from 7 pm to 7 am. YPLA is sponsoring this bulletin board service for sharing ideas about Logo, BASIC, and other topics. The board is available via modem at the regular YPLA number, (214) 783-7548. For more information, contact YPLA, PO Box 855067, Richardson, TX 75085.

Turtle Tot has arrived. The new robot turtle is now in stock, according to Andre Rossi of Harvard Associates, Inc. Turtle Tot can move, draw, blink its eyes and feel its surroundings, and costs \$299. For more information, contact Harvard Associates, 260 Beacon St., Somerville, MA 02143, (617) 492-0660.

Krell Software Corp. is offering its "Turtle Pak" of 20 Logo disks, 2 utility disks, Krell documentation, Dan Watt's Learning with Logo, and the MIT Logo technical manual for \$499.95. (Also offered is a Turtle Pak with 40 Logo disks for \$899.95.) Krell Software Corp., 1320 Stony Brook Road, Stony Brook, NY 11790. Telephone: (800) 24KRELL.

If you are emphasizing off computer activities, you might want to consider Computer Practice Keyboards. These laminated cardboard keyboards are made by a firm appropriately called the Computer Practice Keyboard Company, 616 9th Street, Union City, NJ 07087, for \$4.95 each. The price drops to \$3 each if you order 12 or more. Specify your computer make and model.

Dear Editor,

I have been using Krell Logo with my secondary learning disabled students for the last two years. I recently purchased Delta Drawing (Spinnaker Software Corporation, 215 First Street, Cambridge, MA 02142 - Ed.) and demonstrated this program to my students. I had several Logo files and Delta Drawing files stored on the same disk.

I discovered that Delta Drawing would read in Logo files saved as pictures and would allow these pictures to be colored in. My students were absolutely thrilled with this discovery. They use Logo to write and define their procedures, and Delta Drawing to color in the picture and background.

I think this demonstrates the endless capabilities that the Logo language offers. Surely this new dimension will encourage greater interest and growth in Logo.

Mary Lou Miller
Hilton, NY

>>Thank you for sharing what has been happening in your classroom with our readers. The excitement of your students and the enthusiasm of your letter are genuine testimony to the potential of Logo. Ed.

Dear Editor,

I am the computer coordinator of the Maranhao American School in Sao Luis, Brazil. My students are eagerly exploring and learning with their Logo programs. The only element missing here is my being around other computer educators with whom to share ideas and concerns. In view of this need, I am especially appreciative of your Logo publication.

Neal Strudler
Maranhao American School
Sao Luis Project
1501 Alcoa Building
Pittsburgh, PA 15219.

>>Thanks for sharing your situation with us, Neal. We are happy that the NLX and its many contributors play a part in the excitement of Logo in your part of the world. Ed.