

## The Turtle Goes to College

by  
Lois Tepper

Last summer, I offered a Logo course at Southampton College, New York, which was taken by eight Masters of Education level teachers. With one exception, the teachers "knew nothing about computers," but all were extremely eager to learn. Yet, some were skeptical that the computer would be little more than an expensive ditto machine. But then, that was before they knew about Logo.

The course was designed to begin with a discovery based approach to turtle movements, then move to programming simple geometrical shapes, discussion and implementation of top down programming to produce more complex designs, and, finally, into a discussion of list capabilities.

### GETTING STARTED

Admittedly, my teachers started out with some degree of trepidation. To help overcome this, I had them team up in pairs.

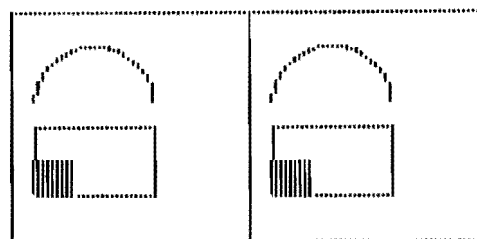
By the second session, everyone was drawing elementary geometrical shapes and experimenting wholeheartedly with the turtle.

Already, I noticed that the teachers who knew how to type were experiencing a degree of frustration because of the special computer keys, and the differences in the keyboards of the Apple II and the IIe. As they progressed, however, their keyboard skills increased, and the frustration began to be replaced with "Ooh!" and "Aah!"

### TEACHER DEMANDS

Soon, my teachers became more demanding. Several wanted to use Logo to write tests and CAI programs. I felt I should use this motivation as soon as possible. Others wanted to work more on their graphics projects.

All demanded more time on the computers! I had to arrange for computer access eight hours per day, with two additional three hour blocks before class, plus two more hours after class! Their enthusiasm for their Logo work was fantastic!

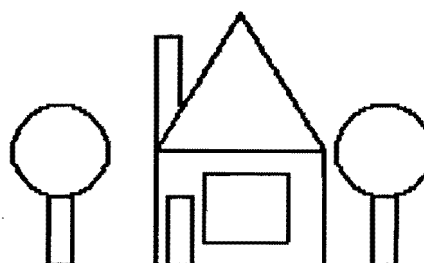


As they progressed, I became aware of peaks and valleys in their learning. Often, I would hear the "Ah-ha!" of a peak experience, when something clicked. It was fun to observe the insight gained when they learned the concept of writing individual procedures for separate tasks and using a superprocedure to call them.

The valleys of frustration were quickly bridged with ready cooperation and support from teammates and other class members.

### IS IT OVER ALREADY?

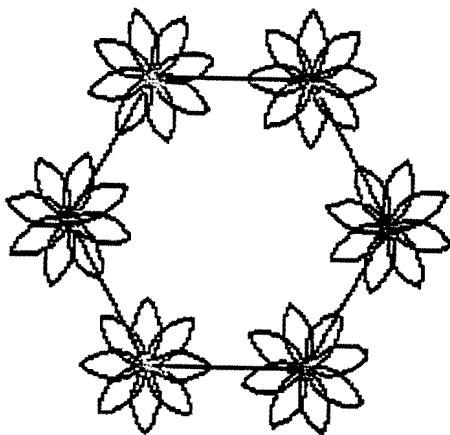
The end of the class came all too soon. As I took stock of what we had done, I became aware that a very special thing had happened.



### College Turtle continued

Certainly, the teachers has been introduced to computers in a meaningful way with Logo. They had created and solved problems in which they had personal interests, and experienced how Logo could introduce their own students to problem solving.

But the special thing was how the class of eight strangers had become eight friends, exchanging phone numbers, arranging camping trips, causing one class member to observe, "I have never been in a class where the members grew so close to each other!"



Logo is like that. Their beautiful social experience underscored the importance of cooperation between children in the Logo problem solving process in a way no lecture or handout could ever do.

But the thing I personally treasure the most was one of the greatest things that can happen to a teacher: they all said over and over how they still wanted more!

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Lois Tepper is an Assistant Professor in Experimental Psychology at Southampton College, Long Island, NY. She is currently studying applications of Logo to special populations.

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## Here's Adam

Coleco's Adam Computer has arrived. According to a recent article in Infoworld, SmartLogo, developed by Logo Computer Systems Inc. (LCSI), will be available. No date was given. Rumors have it, however, that beta site testing has already begun.

## Conference Information

The Arizona State University College of Education announces its fourth annual conference, "Microcomputers in Education," to be held March 15-16. For more information, write Dr. Gary Bitter, College of Education, Arizona State University, Tempe AZ 85287, or call (602) 965-7363.

The professional journal, Computers, Reading and Language Arts, is sponsoring an eastern states conference entitled "Computers & Reading / Learning Difficulties," April 7-8, in Philadelphia, PA. Joyce Tobias, Curriculum Coordinator of Computer Education for Brookline (MA) Public Schools, will deliver a presentation, "Logo and the Language Arts," which will include implications for the teaching of reading and writing with Logo. Krell Software Corporation will give a workshop on improving conceptual thinking with Logo. For more information, call (415) 222-1249, or write Educational Computer Conferences, 1070 Crows Nest Way, Richmond CA 94803.

A national conference entitled, "Technology for Disabled Persons," will be held in Chicago, October 1 - 3. The deadline for proposals is June 1, 1984. Conference presenters will receive a 50% discount off the registration fee. For more information, write to Office of Continuing Education, University of Wisconsin - Stout, Menomonie WI 54751.

## A Contest for Logo

The University of Wisconsin - Parkside announces its fourth annual International Computer Problem Solving Contest, to be administered on Saturday, April 28. Problems involving computation, simulation, patterns, words, and a "mind bender," are offered to three divisions: elementary (grades 4-6, junior (grades 7-9), and senior (grades 10-12). Any computer language may be used in the contest. This is an outstanding opportunity to show what Logo can do. To receive more information on how your school can become a local contest site, write to D. T. Piele, ICPSC, Box 2000, University of Wisconsin - Parkside, Kenosha WI, 53141. A set of problems and solutions from the 1983 contest is reported in The Computing Teacher, October 1983, pages 21 - 26.

## From The Editor

If you have followed college basketball the last few years, you know the name of Ralph Sampson. Standing 7 feet 4 inches tall, he recently turned professional, after a brilliant four years playing for the University of Virginia.

A joke which has made the rounds of Charlottesville goes like this:

- A. Knock! Knock!  
B. Who's there?  
A. Ralph.  
B. Ralph who?  
A. How quickly we forget.

Yes, sometimes we forget rather quickly the way things were. Why, we even forget the way WE were!

Seymour Papert tells of an experiment he performed once, in which he filmed a group of children every three months as they worked a set of Piagetian tests on conservation.

For example, they were shown a glass of water, and watched it being poured into a slimmer taller glass. As expected, the four year old children reported that there was more water in the taller glass.

When the children got old enough to "know" that the amount of water was the same in each glass, Papert asked them if they remembered their earlier responses. The children indicated that they had always said the amount of water was the same.

When shown films of themselves saying the amount of water was different, the children were unable to accept that they had ever said anything except that the amount of water was the same. In fact, they thought the films were fake!

How quickly we forget, indeed!

As adults, let us strive to NOT forget how we were before Logo. Let us not forget our enthusiasm, our confusion, our hopes, our frustration, our accomplishments, our discards.

We are in position to help many other adults along the Logo path. The colleagues who are learning Logo now may not be as confident, as enthusiastic, as hopeful as we believe we were. Our ability to remember our own initial encounters will make better teachers of us all.

FD 100!



## NLXionary

A lectionary of selected Logo readings

compiled by Griff Wigley

Welcome to the NLXionary! Each month, we will present a lectionary of articles on Logo from other publications for your reading pleasure.

### RECENT

Family Computing Magazine, February 1984, "Learning Logo is a Family Affair," by Mindy Pantiel and Becky Peterson, "Different Versions of Logo," by Kenneth P. Goldberg, and "The Man Behind Logo," by Nick Sullivan.

>These three articles form a neat, concise overview of Logo, directed mainly at the home user. If I were to present Logo for the first time to a group of parents, I would steer them to these articles. For the Logo shopper, the Logo comparison article and chart are among the most up to date and accurate I've seen. Logo teachers and Seymour Papert fans will find Sullivan's article and interview the most interesting of the three pieces. New bits of Papert's current thinking are scattered among familiar philosophizing.

Classroom Computer Learning, October 1983, "Logo in Special Education," by Susan Jo Russell.

>This is a jewel among Logo articles. The author clearly is both a thinker and a teacher. Her introduction on computers as timesavers poses an interesting new challenge to the typical use of software in special education classrooms. Two scenarios with handicapped children are used to further illustrate her contention of Logo's usefulness for finding alternative methods of learning and teaching.

## NLXionary continued

Monitor, July / August 1983, "Children, Computers, and Logo," by Dr. George P. Young.

>Here is a Logo article written by the superintendent of the St. Paul, Minnesota, Public Schools. It is just what you need to lay on the desk of your friendly administrator (accompanied by your requisition for Logo related goodies, of course!). The article describes the extensive Logo project in St. Paul, followed by teacher testimonials. The last paragraph contains his observations on how Logo using teachers are changing their whole way of looking at teaching and learning.

### ANCIENT GEMS

Popular Computing, September 1982, "Should Children Be Computer Programmers?" by Dan Watt.

>In this "relic" from the past, Watt answers his own question with a clear YES. Read his comments carefully, however. Problem solving, creative power, and a deeper learning of content are the benefits; job preparation is not, for the most part. Although Logo is not the main topic, this might be just the article you have been seeking for developing goals and objectives in your curriculum with Logo.

### MENTIONABLES

Family Computing, March 1984, "Rendezvous with a Robot."

T.H.E. Journal, February 1984, "Applications" column.

>Both articles explore the use of Logo and other languages with Androbot Company's early version of TOPO the Robot.

Compute!, January 1984, "The Demons of Atari Logo," by David D. Thornburg.

>This article is an exploration of the WHEN demons, a feature of Atari Logo used in collision detection.

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Griff Wigley is co-owner of Family Computing, Inc., a facilitator in the Faribault (MN) Public Schools, and a school board member of Prairie Creek Community School.

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## Papert Addresses Boston Logo Users' Group

reported by  
Nola Sheffer

There was an air of anticipation and excitement at the Boston Logo Users' Group in November, for Professor Seymour Papert was to be the guest speaker. The meeting site had already been changed to accommodate the crowd of over 200.

For his topic, Professor Papert chose to address some of the criticisms of Logo. He prefaced his talk by saying that many of the complaints were not sensible, or reflected an ignorance of the language. Therefore, he would choose to address just two classes of criticism: that of the philosophy, from the perspective of cognitive psychology, and that of the programming perspective. Is Logo the best language to use beyond the turtle graphics? Are there other languages which provide an easier entry into words and lists?

### COGNITIVE CRITICISM

An example of the first type of criticism comes from Roy Pea, a cognitive psychologist connected with the Bank Street College of Education. He decided to test the claim that Logo can be learned without teaching. He put children in a classroom with Logo and computers, and observed the results. In attempting to measure knowledge gained as a result of working with Logo, Pea assumed that using Logo would result in increased planning ability, and tried to measure that.

The result: No apparent increase in planning ability was shown by students after using Logo.

Quite apart from any concerns about the means of measuring planning ability, Papert questions the assumption that learning Logo results in increased planning skills. In fact, Papert asserts that, if there were a true Logo environment, scores on "planning" might actually decrease! Those students who were planners to begin with, would continue to be planners. But, those who were weak in this area might decline because Logo would be the one area in school where a "top down" approach is not pushed, and, thus, the non-planners might feel "liberated" and actually do less planning than before.

## Papert continued

What learning to program will do for an individual will depend upon that individual. Not everyone needs to gain the same benefits. A non-planner might benefit the most from using Logo because the environment would allow him/her to work in a style that is comfortable - an option not generally available in the typical school.

In the case of programming, Papert believes that much of the criticism of the non-graphics part of Logo can be answered by finding better ways to connect graphics and non-graphics. One way of bridging the two is through sprites.

### THE SPRITE CONNECTION

To talk to a particular group of sprites, it is necessary to put them in a list and name them. This gives a nice introduction to both variables and lists. A command can now be given to the whole list, or different commands can be given to each sprite in the list, using recursion to work your way through the list.

Also, Professor Papert thinks that recursion is not so confusing if you have already presented a good model for the calling of subprocedures. One of the models he likes to use is that of "actors," that is, having different people "act out" the work of particular procedures.

### HOW MUCH TEACHING?

A question about the amount of teaching that is needed for Logo was raised. Papert responded that very little teaching might be needed at a place such as the Lamplighter School in Texas, where programming is part of the culture, and the children are used to an informal atmosphere.

Papert saw it as an advantage that, during the first year of using Logo at the Lamplighter School, there were not many teachers available with a knowledge of the language, thus forcing students to use peers, as well as their own resources.

This is NOT to say that it is not necessary to have knowledgeable people around; students do need access to expertise at appropriate times. The issues of when to intervene, and how much intervention is needed, are two of many that Professor Papert will be examining in a project in the Boston Schools.

Apart from an abundance of computers in the classrooms, this Boston project will be an environment quite different from that of the Lamplighter School in suburban Dallas. Unlike the Texas students, these will be students from typical inner city public schools, as opposed to a private school with an informal atmosphere.

It will be very interesting to see what differences, if any, there are either in the learning or the teaching of Logo!

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Nola Sheffer is Co-Director of the Logo Users' Group of the Boston Computer Society.

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## TIPPS for TEACHERS

by  
Steve Tipps

### Triangle Thinking :SIDE3

Searching for an all purpose triangle has been a goal of the last two columns on triangular thinking. In this pursuit, other triangular ideas have been encountered. This month, a possible solution to the problem posed in the February column will be offered. The goal of this problem was to find a relationship between the sides of various triangles and to make a transportable right triangle.

The Type III problem in last month's column would probably be appropriate for seventh graders through college mathematics students. The point of the inquiry would be the discovery of the trigonometric sine function.

I remember learning to use the sine and cosine tables in trigonometry and geometry, but I do not remember ever knowing where they came from or that I had any ability to understand them. For all I knew, the table was of mysterious origin, probably set down by the Greeks or Egyptians from divine inspiration.

A TYPE III problem provides a context for exploring and deriving meanings in math or science or language arts. (See Bull /Tipps, Problem Spaces in a Project-Oriented Logo Environment, NLX Jan-Feb 1984 and The Computing Teacher, Dec 1983-Jan 1984 for descriptions of other problem types.)

## Tiप्ps continued

### AUTO.TRI REVISITED

In the previous columns, a procedure named AUTO.TRI made right triangles of any size with HOME as an anchor. The Pythagorean theorem was used to calculate the length of side 3 (the hypotenuse). A suggestion was made to find the heading of the turtle at each angle. From this information, the possibility of a relationship between the length of the sides and the angles was suggested.

Working through this problem involves many stages. The first step involves finding a relationship between the angles and the sides.

Holding some of the variables constant is essential; making the inputs to AUTO.TRI equal is a good way to simplify the possibilities. Then addition, subtraction, multiplication, and division of the sides may be attempted. Arithmetic operations with variables can be attempted to find a pattern of results.

```
:SIDE1 + :SIDE2
:SIDE3 - :SIDE1
:SIDE1 * :SIDE3
:SIDE1 / :SIDE3
```

Finally, a pattern involving division may be discerned so that, when the sides are equal, the angles are always 45 degrees, and the quotient of :SIDE1/ :SIDE3 and :SIDE2/ :SIDE3 is about .707. This is an important hook into the entire problem.

The information from the different AUTO.TRIangles can be recorded, or a procedure for printing the information can be written. For my solution, I wrote a procedure which I called PRINT.INFO to organize the information about the sides, the angles, and the relationships. Likewise, I wrote CHART.Heading to set up the form.

Getting the sides, angles, and divisions printed out is a good project in itself. The angles are actually calculated to three or four places and the quotients of sides are to seven or eight decimals places. ROUND is a primitive which rounds off a decimal number to the nearest whole number. For example, PRINT ROUND 4.3637732 will return the number 4.

ROUND can be used in a procedure to truncate a decimal fraction to any number of places. For example, if you wanted to round the decimal number 0.65378 to two places, you might first multiply it by one hundred, ROUND the result, then divide it by one hundred. I chose four places for my chart, and called my procedure FOUR.PLACE.

SIDE1	SIDE2	TURN SIDE1/SIDE3	SIDE3	TURN2 SIDE2/SIDE3
30	30	45 .7071	42	45 .7071
50	50	45 .7071	71	45 .7071
90	90	45 .7071	127	45 .7071
30	60	27 .4472	67	63 .8944
60	30	63 .8944	67	27 .4472
45	30	56 .832	54	34 .5547

What has been generated is a sine table for the angles. The accuracy of the table can be compared with another function in Logo. Compare the quotients of the sides with the results using the SIN primitive.

```
PRINT SIN 45
PRINT SIN 63
PRINT SIN 34
```

Also compare the values of the sine functions of Logo to a sine table.

Other ideas which might also be developed from the chart are that the sum of the two angles is always 90 degrees and the quotients are always less than one. An extension would be to graph the values of the sine for all the angles from 0 to 90 degrees. This could be done on paper or with a program written to plot the points with Logo.

### MOVING TRIANGLES

A good TYPE III problem not only has content embedded in it. It also allows you to do something meaningful. The ultimate goal of this exploration was to have a movable right triangle anywhere on the screen. When

## more Tips

the sine values are calculated from the sides, the angles of the triangle are set by turning toward HOME. To have a movable triangle, the angles must be figured from the sides without being dependent on HOME. The challenge is to find the angle associated with a certain sine quotient.

One strategy to approximate the angle would be to turn the turtle slowly from a heading of 0. When the sine of the new heading is greater than the value found by dividing :SIDE1 by :SIDE3, the heading is equal to the value of the interior angle needed to close the triangle with :SIDE3. This procedure tests the sine of the turtle heading against the needed sine.

```
TO ANGLE? :SIDE1 :SIDE2
  HT
  TEST SIN HEADING > FOUR.PLACE :SIDE1 /
:SIDE3
  IFTRUE [OUTPUT HEADING STOP]
  RT 1
  OUTPUT ANGLE? :SIDE1 :SIDE2
END
```

This procedure is one crucial step in getting the turtle to determine the angle which it needs to finish a right triangle. The turtle also has to remember its heading before it makes this judgement and adjust that heading by the amount of the angle discovered. When that maneuver is completed, all the missing pieces are in place for an all purpose, any place, any time right triangle.

I'll leave that as your next puzzle. If you would like a copy of my solution, send a self addressed stamped envelope to me at the NLX, PO BOX 5341, Charlottesville, VA 22905, and ask for the Movable Triangle Procedures. While you're at it, why not enclose your solutions as well? I'd like to see them. Thanks!

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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.

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## Allen's Book is Something to Think About

A review by  
Glen Bull

Four years ago, a book appeared which changed my career. Seymour Papert's Mindstorms: Children, Computing, and Powerful Ideas contained thought-provoking ideas about education. Its treatment of Logo invited me to investigate, and I was captured. I have given away over 20 copies to colleagues. I even placed a copy in the hands of Steve Wozniak (designer of the Apple computer) as he got on the plane to leave after speaking at the University of Virginia's School of Education.

Two years later, a language manual, Apple Logo, by Hal Abelson, was published. This book explified what a language manual should be. It was spiral bound, so that it would lie flat while I was typing at the computer. It had a clean layout, and illustrations at the right points to help me follow the text. Best of all, Abelson's explanations of Logo's commands were superb. Apple Logo promptly went on my bookshelf beside Mindstorms.

Now I have placed a third book beside the first two. I first encountered Thinking about TLC Logo (John R. Allen, Ruth E. Davis, and John F. Johnson, New York: Holt, Rinehart, and Winston, 1984) last spring at the National Educational Computing Conference in Baltimore. I made a considerable nuisance of myself on the way back to Virginia with Steve Tipps and Tom Lough, because I would not stop reading sections of it out loud. Threats of physical violence (which I abhor) were finally used to quiet me.

Thinking about TLC Logo, or TATL (pronounced "tattle") as it is sometimes called, is an irreverent, freewheeling discussion of sophisticated computational ideas. So that you will know my bias, I will report that Thinking about TLC Logo appeals to me at three levels.

## Allen's Book continued

### BOTTOMLEVEL

The first level is that of the lowest, most contemptible form of humor, that of word play. One of the turtles in TLC Logo has the power to make copies, or clones, of himself. Naturally, this turtle is known as the clone arranger, with a suitable picture of the masked marvel in the text. TATL is filled with such double and triple meanings.

### MIDDLELEVEL

Graphics are the second aspect of the book which captured me. I don't know if there is a term for graphic puns, but there are not only turtles, but ducks, rabbits, and humans (the authors?) in illustrations of visual humor throughout the book. The visual element contributes to a general feeling of irreverence.

The first edition I saw was a special version for the Aquarius computer. One of author's names was deliberately printed upside down on the cover. I regret to say that this has been rectified in a retreat to reality in the more general edition.

### TOPEVEL

The third element of the book caused me to leave it on my bedside table for some time. Thinking about TLC Logo includes discussions of elegant ideas. Ideas are the heart of this book. The subtitle of Mindstorms is "Children, Computing, and Powerful Ideas". The subtitle of TATL is "A Graphic Look at Computing with Ideas". Both books are dedicated to the concept that thinking and learning can be fun, and both are centered around the use of Logo as a tool to explore those ideas.

The TLC in TLC Logo stands for "The Lisp Company," the name of Allen's software development business. However, TATL was written in a "generic" style, so that it can be used with any Logo version.

TATL is influenced by historical perspectives from artificial intelligence and LISP. (LISP is a computing language used for artificial intelligence studies, and is the direct ancestor of Logo.) TATL devotes considerable space to questions of deductive logic. It brings with it a heavy infusion of ideas from LISP which properly belong to Logo as well.

I would not advocate placing a copy of Thinking about TLC Logo in every elementary classroom. The book is not written at a third grade level. I do believe that every one who is holding a workshop for teachers on Logo should have a copy of this book, so that they obtain a feeling for the proper breadth and perspective of Logo.

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

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## Logo In The News

Molly Watt's education column in the February issue of inCider magazine is entitled, "De-Bug Collection." If you have been looking for ways to help your students use their "mistakes" to good advantage, don't miss this informative article. Molly traces the struggle of Tanya and Bill as they attempt to draw a boat with Logo. She encourages adults to become comfortable with the everpresent Logo programming bugs, and share them with their students. Reading this piece brings back memories of the lessons suggested by Nancy Sopp in her near-classic "Logo Mess Ups: Process vs. Product," from the NLX, October 1983.

On page 78 of February's Instructor magazine, Joyce Tobias mentions her Logo classes in the Brookline (MA) Public Schools which are run on a network of computers with a hard disk system.

A review of DR Logo appears in the February 13, 1984 issue of Infoworld magazine. All categories examined were rated excellent. Also in the same issue, Tom Snyder, president of an educational software development company, suggests that, in an ideal world where the effects of Logo could be properly tested, we would find that the teachers changed more than the students!

An article in ISO World, November 14, 1983, page 105, outlines the plans of several companies for taking Logo out of the classroom and into the office. "Logo Isn't Just for Kids Anymore" documents support from Digital Equipment Corporation (DEC) and Digital Research Inc. (DRI) as evidence for more Logo utilization in business applications.



# MICROWORLDS

by  
Glen Bull

## Centering Titles

In the January 1984 NLX, I described a method for using the Logo editor to write text to be printed on the screen. This month, I will continue our list operations exploration with the development of a procedure to center titles. This procedure can be used with the WRITE procedure of January, reproduced below.

Terrapin Version  
Apple or Commodore

```
TO WRITE :PROCEDURE
  WRITE.LINE BUTFIRST TEXT :PROCEDURE
END
```

```
TO WRITE.LINE :PROCEDURE
  IF :PROCEDURE = [] STOP
  TEST LIST? FIRST FIRST :PROCEDURE
  IFTRUE RUN FIRST FIRST :PROCEDURE
  IFFALSE PRINT FIRST :PROCEDURE
  WRITE.LINE BUTFIRST :PROCEDURE
END
```

LCSI Version  
Apple or IBM

```
TO WRITE :PROCEDURE
  WRITE.LINE BUTFIRST TEXT :PROCEDURE
END
```

```
TO WRITE.LINE :PROCEDURE
  IF EMPTY? :PROCEDURE [STOP]
  TEST LIST? FIRST FIRST :PROCEDURE
  IFTRUE [RUN FIRST FIRST :PROCEDURE]
  IFFALSE [PRINT FIRST :PROCEDURE]
  WRITE.LINE BUTFIRST :PROCEDURE
END
```

These procedures allowed a block of text to be printed without resorting to a series of PRINT statements. They also allowed commands enclosed in brackets to be placed on a line, as in an adventure story setup.

TO INSTRUCTIONS

[TAB 6]

ADVENTURE STORY INSTRUCTIONS

[BLANK.LINE]

AT SEVERAL POINTS IN THE ADVENTURE YOU WILL BE GIVEN A CHOICE BETWEEN TWO ALTERNATIVES. EACH TIME TYPE "A" TO CHOOSE THE FIRST CHOICE OR TYPE "B" TO CHOOSE THE SECOND.

[BLANK.LINE]

PRESS THE SPACE BAR TO CONTINUE.

END

The instructions for the adventure game could be printed on the screen by typing:

WRITE "INSTRUCTIONS

with the following results:

ADVENTURE STORY INSTRUCTIONS

AT SEVERAL POINTS IN THE ADVENTURE YOU WILL BE GIVEN A CHOICE BETWEEN TWO ALTERNATIVES. EACH TIME TYPE "A" TO CHOOSE THE FIRST CHOICE OR TYPE "B" TO CHOOSE THE SECOND.

PRESS THE SPACE BAR TO CONTINUE.

COMMANDS USED WITH WRITE

The TAB command tabbed the title over six spaces, and the BLANK.LINE command inserted blank lines at the indicated points. The command for a blank line is simply:

```
TO BLANK.LINE
  PRINT []
END
```

The TAB command consists of the following procedure in Terrapin and LCSI Logo respectively.

```
TO TAB :SPACES
  REPEAT :SPACES [PRINT1 CHAR 32]
END
```

```
TO TAB :SPACES
  REPEAT :SPACES [TYPE CHAR 32]
END
```

COUNT

The TAB command was used to center the title of the instructions. Since there were 40 spaces across the screen, I counted the number of letters in the title (26) and subtracted them from 40:

40 spaces on the screen - 26 letters = 12

## Microworlds continued

The answer (12) is divided by two to determine how many spaces should be on either side of the centered title. While I was laboriously counting letters (one .. two .. three ...), it occurred to me that I could use the Logo command COUNT to count the letters for me. Therefore I quickly typed:

```
PRINT COUNT [ADVENTURE STORY INSTRUCTIONS]
```

and obtained the result:

3

There were clearly more than three letters in the title. The command COUNT was counting the number of words in the list, instead of the number of letters in the list. After thinking for a moment, I tried:

```
PRINT COUNT "ADVENTURE
```

and got the answer:

9

More thought. The command COUNT counts the number of words in a list, and the number of letters in a word. (Keep in mind that, in Logo, a list is a series of items enclosed in brackets, and a word is a series of letters preceded by a quotation mark.)

If you are using Terrapin Logo, note that version 1 does not have a COUNT primitive. The following procedures will provide this capability. Version 2.0 of Terrapin Logo for the Apple has a COUNT primitive.

```
TO COUNT :ITEMS
  OUTPUT COUNT.LOOP :ITEMS 0
END
```

```
TO COUNT.LOOP :ITEMS :NUMBER
  IF :ITEMS = [] OUTPUT :NUMBER
  OUTPUT :COUNT.LOOP BUTFIRST :ITEMS
:NUMBER + 1
END
```

### COUNTING STRATEGY

I wanted a procedure to count the number of letters in a list. Here is one possible strategy.

To count letters in a list

Count the letters in the first word in the list

Count the letters in the next word in the list & add the result to the number of letters in the first word

If all the words in the list are exhausted, output the number

End

This procedure can be expressed as follows for Terrapin and LCSi respectively.

```
TO COUNT.LETTERS :LIST :NUMBER
  IF :LIST = [] OUTPUT :NUMBER
  MAKE "NUMBER COUNT FIRST :LIST + :NUMBER
  OUTPUT COUNT.LETTERS (BUTFIRST :LIST)
:NUMBER
END
```

```
TO COUNT.LETTERS :LIST :NUMBER
  LOCAL :NUMBER
  IF EMPTY? :LIST [OUTPUT :NUMBER]
  MAKE "NUMBER COUNT FIRST :LIST + :NUMBER
  OUTPUT COUNT.LETTERS (BUTFIRST :LIST)
:NUMBER
END
```

### COUNTING BUGS

The COUNT.LETTERS procedure has a bug in it. The number of letters in the title is 26, but the COUNT.LETTERS procedure said there were only 24 letters.

```
PRINT COUNT.LETTERS [ADVENTURE STORY
INSTRUCTIONS] 0
```

24

Aha! When I looked at the English description of the procedure, I found that I was counting the number of letters in each word, but I was not counting the number of spaces between the words. Can you find a way to modify the procedure to fix the bug?

```
*****
Pause for Logo detective work
*****
```

If you are still with me, I assume that you have found a way to fix the COUNT.LETTERS procedure so that it counts the spaces between the words. My first attempt to fix the bug was to add one to each word in the title. However, that fix resulted in yet another bug, which made the count one more than it should have been. (The last word in the title doesn't have a space after it.)

## more Microworlds

### CENTERING

I now had a working procedure to count the numbers of letters in the title. At this point, I was a small step away from a procedure to automatically center a title. The formula for centering a title by hand was:

$(40 \text{ Spaces on the Screen} / \text{Letters in Title}) / 2$

A COUNT.LETTERS procedure can be used to write this as:

```
(40 - COUNT.LETTERS [ADVENTURE STORY
INSTRUCTIONS] 0 ) / 2
```

Therefore a CENTER procedure can be written as:

```
TO CENTER :TITLE
  TAB (40 - COUNT.LETTERS :TITLE 0)/2
  PRINT :TITLE
END
```

There is a great deal of pleasure in watching a title go zinging over to the middle of the screen.

```
CENTER [A SAMPLE TITLE]
```

A SAMPLE TITLE

The CENTER command can be used in conjunction with the WRITE procedure.

```
TO INSTRUCTIONS
  [ CENTER [ADVENTURE STORY INSTRUCTIONS] ]
  [BLANK.LINE]
  AT SEVERAL POINTS IN THE ADVENTURE YOU WILL
  BE GIVEN A CHOICE BETWEEN TWO ALTERNATIVES.
```

```
...
END
```

The CENTER command will work with both text printed on the screen, and with text sent to the printer. If the width of the screen or page changes from 40 columns to another width, adjust the CENTER procedure by changing the number 40 to the new width of the page.

Good luck, and have fun with your new centering capability. I would be interested in hearing what you do with it.

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.

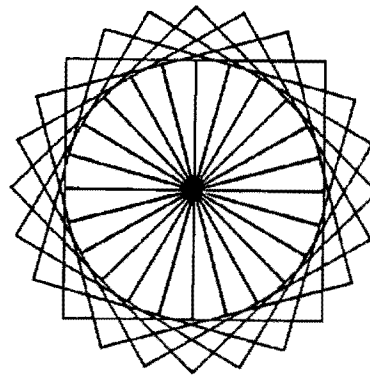
## Sweet P is a Sweetheart

by  
Steve Tipples

Among the peripherals which can be used with Logo, my personal ranking is as follows. A printer is mandatory, a robot turtle is necessary, and a plotter is desirable. But, do not underestimate the potential represented by a plotter with Logo.

There is a reason why there are not many plotters being used with Logo today. The cost of plotters has been so high that purchasing one which was both accurate and able to draw in a variety of colors was virtually impossible. Radio Shack and Commodore have had inexpensive plotters which were very serviceable. But they couldn't match some features of the big boys such as the Bausch and Lomb or Houston Instruments plotters, with price tags of \$1500 and up.

One of the first moderate priced, versatile printers available is the Sweet P by Enter Corporation. Terrapin has written a set of plotter routines to interface with the Sweet P, which result in some fantastic turtle drawings.



### PLOTTING WITH PLOGO

After trying several of the demonstration programs supplied with the Sweet P, software, I moved on to the Logo interface written by Mark Eckenwiler of Terrapin. The primitive Logo commands have been put into a shell (turtly speaking) of plotter commands which are named the same with the prefix P: FD becomes PFD, BK is PBK, etc.

## Sweet P continued

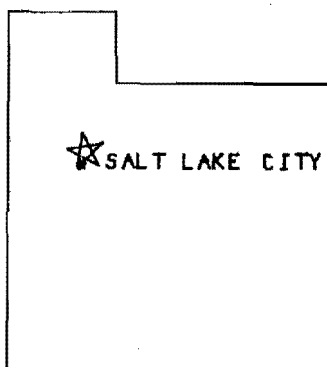
This convention seemed very natural and made converting regular turtle drawing to plotter programs quite easy. For example, CIRCLE became PCIRCLE.

```
TO CIRCLE
REPEAT 36 [ FD 30 RT 10 ]
END
```

```
TO PCIRCLE
REPEAT 36 [ PFD 30 PRT 10 ]
END
```



Commands for printing text, changing the size and direction of text, putting the pen up and down, and placing the turtle at any X or Y position and heading form a complete set of plotter primitives.



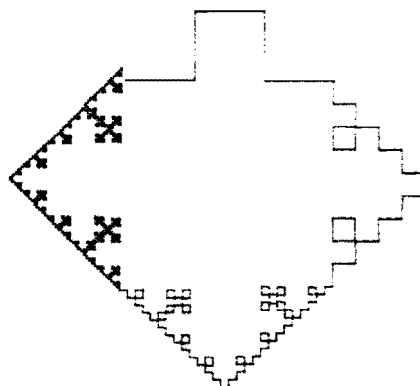
A HELP procedure provides an overview of the software and a SETUP is used to tell the computer which expansion slot is being used for the plotter.

I created a problem for myself with the primitives when I converted my standard MOVE procedure to PMOVE. This act wiped out the Terrapin PMOVE primitive, which is critical in many other commands! After a 30 minute puzzle, I discovered my mistake and made MOVEP for my MOVE.

### ON LINE TEST

I worked with the Sweet P for several weeks and invited Tom Lough and Glen Bull to

put it through its paces. Tom immediately went to his fractal programs (See "Fractal Fun with Logo," NLX, October 1982.) to see how accurately it would plot. He was amazed at the small closure error after such a complex drawing.



Next, I decided that the plotter needed to face the real world test. I took the Sweet P plotter to a Saturday Logo class of sixth grade students at Jack Jouett Middle School in Charlottesville. The students were working with Logo in preparation for being laboratory assistants for their teacher, Becky Poplin.

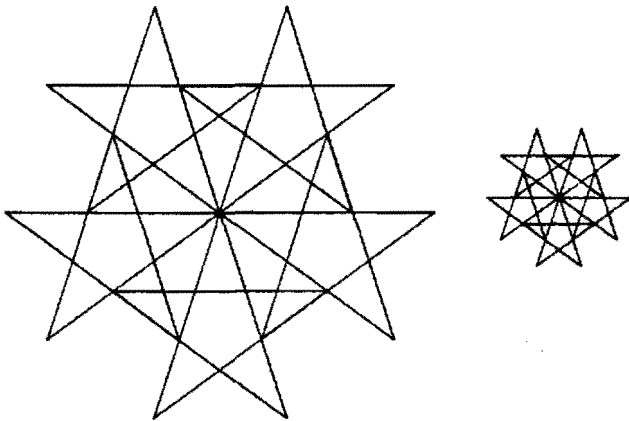
A number of them had had Logo experience the year before as part of the Albemarle County - University of Virginia Logo Project.

I showed them how I had made a star in a circle and the two separate programs - one for the monitor and one for the plotter. They were able to see immediately how the program was changed. When the students completed and saved their programs, they would bring their disks over to the computer with the plotter and convert them to plotter routines. I played keyboardist in this conversion process.

Watching the plotter plot was as fascinating to them as to me. They wanted to know how the plotter worked and observed carefully how the paper movement and pen movement coordinated to draw figures. Plotting out their pictures proved to be an additional incentive to make elaborate designs. I also took the conversion opportunity to work on modularity and readability of programs.

## Sweet P continued

One of the nicest features we found in plotting students' pictures was the ability to change the sizes of the pictures with an expansion variable. MAKE "EXPANSION 3 is the default, but "EXPANSION value of 1 makes very good drawings one third smaller. Playing with ratios on the plotter would be an important exploration.



Two of the plotter logistics which I had to work out were threading the paper into the plotter accurately and changing the pens. Since the plotter pen senses where it is on the paper, getting it set up accurately is very important.

The manual with the Sweet P outlines a paper loading procedure that does not work because there is no "paper load button" as the manual claims. After a few attempts, I devised a system using the LOWER LEFT button which worked very well.

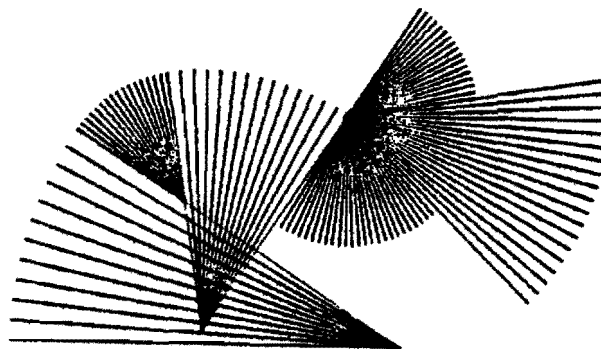
Changing pens is not difficult, but the lines will come out jiggly and wiggly unless the pen is firmly seated in the holder and the holder in the plotter arm.

After receiving specific instructions and cautions, students were able to feed the paper and change the pens without difficulty. However, changing the pens manually was a little irritating. CHANGE PEN makes the plotter pause for pen changes, but I finally got tired of taking the holder out, changing pens, and replacing it.

I didn't solve the issue but I learned to avoid it by plotting in only one color. Having enough pen holders for all the pens would be a good idea. Holders for commercial felt tip pens are available according to the user manual.

The paper which came with the plotter was fairly heavy and slick. I substituted 20 pound printer paper and it worked well, although the ink tended to soak through. Some of our designs, such as SPIN.PSQUARE, ate a hole in the paper at HOME (after 200 repetitions). We could have put the the pen up and down right at HOME or reduced the number of rotations.

I also found that turning the plotter so that its orientation was the same as the monitor was important in following and debugging programs.



## SUMMARY

I found no operational faults with the Sweet P and many strengths. It costs less than \$600 and should have many uses beyond Logo in schools. Overhead projections for classroom and charts for the teachers or administrators will be easy to make with the Sweet P, for example. An optional graphics program called Sweet-Plot 80 is available from Enter.

The plotter interface will be available on the Utility disk to purchasers of the new 2.0 Terrapin Logo version. Terrapin 2.0 upgrades will not include the new Utility Disk. However, you will be able to obtain the plotter program if you contact Terrapin.

Contact Enter Computer, Inc., 6867 Nancy Ridge Drive, San Diego CA 92121, (619) 450-0601 for more information on the Sweet P plotter. Terrapin Inc., 380 Green Street, Cambridge MA 02139, (617) 492-8816 can provide information on the interface with Terrapin Logo.

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

## From the NLX Mailbag

Dear Editor,

I can't shake the feeling that the early introduction of recursion when teaching or presenting Logo is a classic case of dressing up a shortcoming and calling it an advantage. Let me explain.

Logo, for all its good features, has a very primitive set of operators for handling iterative processing. REPEAT gives an introduction to iteration, but the nature of iterative processing is better presented with WHILE and UNTIL operators. The ones I use with MIT Logo look like this:

```
TO WHILE :CONDITION :ACTION
  WHILE1: IF (RUN :CONDITION) RUN
:ACTION ELSE STOP
  GO "WHILE1
END
```

```
TO UNTIL :CONDITION :ACTION
  UNTIL1: RUN :ACTION
  IF NOT (RUN :CONDITION) GO "UNTIL1
ELSE STOP
  END
```

Once you recover from the shock of seeing a GO operator, you'll notice that the functions are, in fact, well structured. It's interesting to note that Harold Abelson in Logo for the Apple II has a similar WHILE function, but uses recursion to do it.

My feeling is that it is easier to learn the use of recursion if one has a solid grounding in iteration controlled by variables.

As a sidelight, I set up the following program:

```
TO TEST
  MAKE "LEN 10
  WHILE [LEN < 50] [FD :LEN RT 20 MAKE
"LEN :LEN + 10]
  PRINT :LEN
END
```

The final PRINT command will show that LEN is 50. This means that the variables within the WHILE statement are accessed by reference rather than value. This is extremely valuable, but not well documented.

John B. Boddie  
Newark DE

## Logo Notes

The Logo Users' Group of the Boston Computer Society has plans to resume its Polyspiral publication. For more information, write to Nola Sheffer, Co-Director, Logo Users' Group, Boston Computer Society, 8 Garden Court, Cambridge MA 02138.

Logo is gaining momentum in the Netherlands. Logo Centrum Nederland publishes an extremely interesting newsletter called Schildpad Nieuws (Dutch for Turtle News). Editor Harry Pinxteren and others report on exciting Logo happenings, along with translations of selected parts of the YPLA's Turtle News, and The Turtle Sourcebook.

Harry and his group are working on an enhanced Logo version with more LISP features and an improved system dialog. Additionally, it is being designed to be completely portable and machine independent. Periodic progress reports will be published.

If you are interested in contacting them, write Logo Centrum Nederland, Attn: Harry Pinxteren, Postbus 1408, 6501 BK Nijmegen, The Netherlands. Their telephone number is 080-238074.

Do you use Logo with handicapped children? Prentice-Hall has available a book entitled, "Making Toys for Handicapped Children," which includes details for the construction of many toys which could be used for offcomputer activities. For more information, write Prentice-Hall Inc., Englewood Cliffs NJ 07632.

Apple Computer has released the Macintosh, its newest offering. Already, rumors have begun about a Logo version for it. Digital Research Inc. (DRI), producer of DR Logo for the IBM PC, is said to have begun work on a Logo for the Macintosh.

Have you been searching for a source of "odds 'n' ends" for offcomputer activities? Send off for a copy of the "Surplus School Stuff" catalog right away! This 48-page publication contains the most incredible assortment of stuff you can imagine, at fairly reasonable prices. Send 50c to Jerryco, 601 Linden Place, Evanston IL 60202.

## Logo Notes continued

Here are some more low Logo prices from Strictly Software Inc.

Commodore Logo	\$57.38
PC Logo	\$112.46
DR Logo	\$79.96

Major credit cards are accepted. They charge \$3 for shipping and insurance per order. Strictly Software Inc., 28 Barrett Road, Katonah NY 10536. (914) 232-4844.

Conroy - LaPointe Inc. advertises Terrapin Logo for \$99, DR Logo for \$69, and the Koala Touch Tablet for \$85. Call (800) 547-1289.

For an interesting perspective on how the computer can cure our education ills, read the article about B. F. Skinner in the February 6, 1984, issue of Infoworld.

The famed Lamplighter School announces "Fun Days," a summer experience for children who have completed kindergarten. Logo computer programming will be introduced by some of the most experienced Logo teachers in the world. In addition, sessions entitled, "Logo for Teachers," will be taught for both beginners and advanced Logo users, in which educators will become acquainted with effective Logo teaching strategies and techniques. For more information, write The Lamplighter School Summer Program, 11611 Inwood Road, Dallas TX 75229.

Dr. Eleanor Roberts announces a series of Logo classes for parents and children. For more information, write to her in care of Micro-Class, 103 Marshall Bridge Road, Kennett Square PA 19348.

The University of Missouri - Columbia announces a 2-hour credit course in Logo for the summer of 1984. For more information, write to Summer Program, University of Missouri - Columbia, 301 Hill Hall, Columbia MO 65211.

Are you teaching any summer Logo courses or workshops? Do you offer Logo consultation services? If so, send us information so we can inform our readers.

## NLXual Challenges

with Robs Muir

### Mirror, Mirror

The difficulties encountered in solving a computer problem can usually be distilled into two distinct categories: difficulties in concept, and difficulties in coding. Most of the problems presented in this column to date have involved issues of concept, since this is of fundamental value in a Logo environment. The strength of turtle graphics is its ability to allow exploration of mathematical ideas without much syntactic (coding) knowledge of Logo.

But, Logo is more than merely a graphics language. It includes features present in only the most modern computer languages. This month's problem involves the use of some of the most important, and most overlooked, abilities of the Logo language, abilities which link Logo to the realm of artificial intelligence.

Logo has the ability to modify its own procedures, and to write new ones. Languages which permit computer programs to write more computer programs are important tools for education. Armed with such languages, we can simulate and study the very thing our minds do.

Let's take an example. If you enter the Logo editor and write a procedure to draw a rectangle, it might look something like this:

```
TO RECTANGLE :WIDTH :LENGTH
  REPEAT 2 [FD :WIDTH RT 90 FD :LENGTH RT 90]
END
```

If you now wanted a procedure which would draw a mirror image RECTANGLE, you would have to either move the turtle to a new heading and position, or write a new RECTANGLE procedure and substitute all RT commands for LT commands. If you intend to draw many symmetrical patterns, this can be a tedious process.

## Challenges continued

Fortunately, Logo can permit you to write a procedure which will write new procedures. Our problem, then, is to write a procedure which will take another procedure as input and write a new procedure with the commands RT and LT interchanged. This newly created procedure can then be used to draw a symmetrical shape.

The tools you will need for this project are the Logo primitives TEXT and DEFINE. Here are some examples of their function.

```
PRINT TEXT "RECTANGLE
[:WIDTH :LENGTH][REPEAT 2 [FD :WIDTH RT
90 FD :LENGTH RT 90]]
```

```
DEFINE "CIRC [[:SIZE][HT][REPEAT 36 [FD
10 RT 10][ST]]
```

```
POTS
TO RECTANGLE :WIDTH:LENGTH
TO CIRC :SIZE
```

Variations of these primitives appear in MIT, LCS1, and TI Logo implementations. Consult your reference manual for the minor differences.

For further study on symmetry, see "Tips for Teachers," NLX, October 1983, and Logo: An Introduction, by J. Dale Burnett, Creative Computing Press, 1983.

As with all NLXual Challenges, if you want to receive a possible solution, send a copy of your solution (or your attempt) with a letter size self addressed stamped 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 would like to submit a challenge or puzzle for this column, send your ideas to the above address.

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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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## Spanish Logo From TI Available

Texas Instruments announces the availability of TI Logo in a Spanish version for use with its TI 99/4 and 99/4A home computer systems. Several educators who teach in inner city schools with a large Hispanic population have expressed interest in such a Logo version. TI Spanish Logo I is available now for systems with a 32K memory expansion, disk drive, and controller. TI Spanish Logo II will be available in the third quarter of 1984, and requires only the 32K memory expansion unit. The price for each version is \$129.95. Send check or money order payable to Texas Instruments Inc. to: Latin American Division, Texas Instruments Inc., PO Box 225621, MS 3922, Dallas TX 75265. Mark the envelope for the attention of Marge Braswell. Allow 6 weeks for delivery.

## Oops

Jo Winkleman called to claim Drew Model School for Arlington (VA) schools. Steve Tipps misplaced the school in neighboring (and rival) Alexandria in his "Right Here in Turtle City" article last month. BK 20.

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Editor.....Tom Lough