Multiple Turtles Without Sprites

by James Hurley

My interest in Logo is in its appplication as a tool in learning and teaching physics. Most problems in physics involve more than one object, and need Logo versions with multiple turtles for an effective representation.

Unfortunately, the most widely used Logos (for example, Apple Logo and Terrapin Logo) lack multiple turtles. However, there are ways to simulate the effects of multiple turtles using only a single turtle Logo version. In this article, I present one method I use with my physics classes.

Turtle Herd

Atari Logo has four turtles, and uses the ASK command to control them. If you type

ASK 1 [HOME FORWARD 50]

turtle number 1 goes to the home position and heading, then goes forward 50 steps. A procedure which performs the same tasks as ASK could be written for single turtle Logos to simulate multiple turtles.

To accomplish this, we may use the turtle number as a variable, and associate with it a list of two elements: the list of the position, and the heading. For example, if we type

MAKE 1 [[30 40] 90]

then turtle number 1 has associated with it a position of (30, 40) and a heading of 90˚. Sometimes information such as that in this list is called the *state* of the turtle.

Now let's set up a herd of four turtles, numbered 0, 1, 2, and 3, to keep the "main" turtle company. The HOME.ALL procedure initializes the new turtles and places them all at HOME. (The procedures which follow are for LCSI Logos. See the notes at the end of the article for MIT Logos, such as Terrapin.)

```
TO HOME.ALL
LOCAL "N
MAKE "N 0
REPEAT 4 [ MAKE :N [ [ 0 0 ] 0 ] MAKE "N :N + 1 ]
END
```

If you type PONS, you find that all four turtles have the same state; that is, all are at (0,0) with a heading of 0˚.

```
3 IS [ [ 0 0 ] 0 ]
2 IS [ [ 0 0 ] 0 ]
1 IS [ [ 0 0 ] 0 ]
0 IS [ [ 0 0 ] 0 ]
```

Now that we have initialized the turtles, we can use the information in the lists to manipulate the turtle states. For example, we can direct any of the turtles with ASK.

```
TO ASK :TURTLE.NUMBER :COMMAND.LIST
MAKE "OLD.POS.HEADING LIST POS HEADING
PU SETPOS FIRST THING :TURTLE.NUMBER
SETHEADING LAST THING :TURTLE.NUMBER
PD RUN :COMMAND.LIST PU
MAKE :TURTLE.NUMBER LIST POS HEADING
SETPOS FIRST :OLD.POS.HEADING
SETHEADING LAST :OLD.POS.HEADING PD
END
```

Multiple Turtles continued

In ASK, we first note the state of the "main" turtle and record this as the OLD.POS.HEADING. Next, we set the ASKed turtle to its former position and heading, and run the COMMAND.LIST. After this action, the turtle may be in a different state, with a new position and heading. So the turtle state list is updated by MAKE :TURTLE.NUMBER LIST POS HEADING. The "main" turtle is then put back in its original state, ready to continue.

All instructions in the COMMAND.LIST must be commands. If an operation is included, a command must be present to accept the input. Otherwise, the ASK procedure stops.

The lists which were set up with HOME.ALL could be extended to include the pencolor, whether the ASKed turtle is shown or not, and other characteristics. Some students like to use names instead of numbers to identify the ASKed turtles. What other extensions can you think of?

Follow That Turtle

Here is a simple demonstration of an activity which draws the path of a homing turtle following a target turtle traveling in a circle. Part of the homing path is shown in the figure. What do you think the rest of the path will look like?
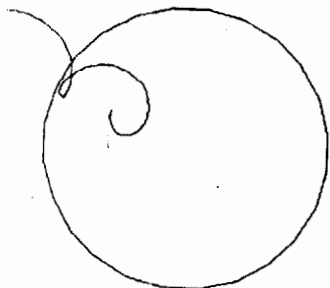

```
TO SETUP
HOME.ALL
ASK 0 [ PU SETPOS [ 80 80 ] SETHEADING 120 PD ]
ASK 1 [ PU SETPOS [ -80 80 ] PD ]
FOLLOW
END


TO FOLLOW
ASK 0 [ FD 25 RT 15 MAKE "TARGET POS ]
ASK 1 [ SETHEADING TOWARDS :TARGET FD 5 ]
FOLLOW
END
```

You can vary the results by changing the inputs to FD in FOLLOW. These inputs correspond to the speeds of the two turtles.

Hunt the Monkey

Here is a more complex application of multiple turtles I use in my physics classes. This simulates a classic demonstration called "The Monkey and the Hunter."

A monkey is hanging from the limb of a tree. A hunter some distance away aims a rifle *directly* at the monkey and fires. At the same instant, the monkey lets go of the limb and drops, hoping to get out of the way of the bullet. Unfortunately for the monkey, the bullet finds its mark ... *every time!*

The reason for this remarkable result is that the bullet follows a parabolic trajectory whose shape depends on the muzzle velocity of the bullet. If the velocity is high, the bullet travels quickly and strikes the monkey at a position just below the limb, before it has fallen very far. If the velocity is low, the bullet hits the monkey after it has fallen some distance.

The purpose of this experiment is not frivolous. It demonstrates Einstein's principle of equivalence: the equivalence of an accelerated frame of reference and a gravitational field. If the experiment is viewed from the point of view of an observer falling in the gravitational field with the monkey, the monkey is seen at rest, with the bullet traveling in an apparent line straight to the mark.

Here is a set of procedures for this experiment.

```
TO MONKEY.AND.HUNTER :MUZZLE.VEL
        :MONKEY.POS
CS FULLSCREEN
HOME.ALL
MAKE "GRAVITY 0.2
MAKE "MONKEY :MONKEY.POS
MAKE "HUNTER [ -100 -100 ]
HIDETURTLE
ASK 0 [ PU SETPOS :HUNTER SETH TOWARDS
        :MONKEY MAKE "DIRECTION.TO.MONKEY
        HEADING ]
ASK 1 [ PU SETPOS :MONKEY ]
STEP (:MUZZLE.VEL * SIN :DIRECTION.TO.MONKEY)
        (:MUZZLE.VEL * COS
        :DIRECTION.TO.MONKEY) 0
END


TO STEP :VX :VY :VEL.MONKEY
ASK 0 [ INC.XY :VX :VY ]
ASK 1 [ INC.XY 0 :VEL.MONKEY ]
STEP :VX (:VY - :GRAVITY) (:VEL.MONKEY -
        :GRAVITY)
END


TO INC.XY :X :Y
SETPOS LIST (XCOR + :X) (YCOR + :Y)
END
```
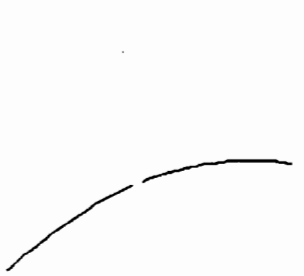
The main procedure, MONKEY.AND.HUNTER, has two inputs. The first input lets you choose the muzzle velocity of the bullet. The second input is the initial position of the monkey. If you type

MONKEY.AND.HUNTER 8 [100 80]

and humanely interrupt the program before violence is done, the figure below is produced.

If you have a Logo version with multiple turtles already on board (Atari Logo, Commodore Logo, Sprite Logo, etc.), you can begin to program these applications directly.

There are many other uses for multiple turtles, of course. I have used as many as 100 of them stationed along the x-axis to draw a histogram, for example.

Although the ASK procedure is not particularly fast, it does the job and demonstrates once again the pleasure of working with an extensible language. As you and your students gain more experience with Logo, the power of this extensibility will make itself known.

MIT Logo Notes

The MIT Logos do not use the same approach to position as LCSI. Instead of POSition lists and the SETPOS command, the x- and y-coordinates are used separately. I suggest that the following HOME.ALL procedure be used to develop a group of MIT Logo procedures similar to those in this article.

```
TO HOME.ALL
LOCAL "N
MAKE "N 0
REPEAT 4 [ MAKE WORD " :N [ 0 0 0 ] MAKE
    "N :N+1 ]
END
```

James Hurley uses Logo to teach physics at the University of California at Davis, and is the author of *Logo Physics*, published by Holt, Rinehart and Winston.

From The Editor
by Tom Lough

Names are fascinating. I marvel that we humans attach names to practically everything, from the muscles and bones of the body to the emotions dominant at various stages of growth and development, from the characteristics of the smallest component of the sub-atomic world to the descriptors of the universe itself.

We also attach names to ourselves. When Posy and I got the news that our son was on the way, we knew we faced the somewhat awesome responsibility of assigning a name to a fellow human being. After reading through a number of "Name Your Baby" books, I wrote a Logo program which used a list of 550 first names, and printed an endless list of various combinations of them with "Lough."

There were some interesting ones, to be sure. Those of you who saw the printout at MECC 82 might remember the likes of Winthrop Maximilian Lough, Chad Leo Lough, and Kyle Sherlock Lough!

But we didn't use these names, because they had no meaning for us. Instead, we chose Kyser Thomas Lough, which contains an old family name and the name of his dad (that's me!).

When we call Kyser by his name, we are not just using a word which has been assigned as his label. We are using a word that means something to us. (By the way, he is into his "terrible twos," and we have to call him quite often for various reasons!)

At a workshop this summer, Seymour Papert challenged us to concentrate on the NAME primitive and the thinking which is associated with it.

Using meaningful names is certainly part of the process. But, in order to NAME a variable or a procedure meaningfully, we must understand something about what it is supposed to represent or do. The search for this understanding is a very special kind of learning that sticks to one's ribs, so to speak.

Let's invite our students to play the name game at deeper levels, by encouraging them to choose descriptive words based on a personal understanding they have discovered for themselves. After all, isn't this what taking responsibility for one's own learning is all about?

The next time someone calls you by name, let it serve as a reminder of the process which accompanies meaningful naming and affirm your determination to explore more of the ideas in names.

I suppose Glen would call it something like "Nameful Thinking."

FD 100!

Tipps for Teachers
by Steve Tipps

Rooms for Logo

Look around the room where you are reading. You probably see chairs and tables and windows. Whether you are at home or at school, certain objects are in your view. For each of you, the arrangement is different. If you leave the room and sketch all the things you can remember, the sketch is an approximate reconstruction of your room. Your sketch can also be used as a kind of rudimentary map of your territory.

Globes and mercator projections represent the entire Earth's surface. Road maps are needed to plan and to complete vacations. City maps are used to locate homes, parks and restaurants. In each case, the map is a symbolic picture. Success with maps presumes that children (and adults) have concrete ideas for the symbols.

Map making is a good way to make the connection between real objects and symbols. Logo is a good tool for map making. Turtle graphics can be used to draw the representations. The extensibility of Logo allows maps to be adapted to each class or child.

Class Maps

Map skills are included in most elementary social studies programs. While some programs begin with formal maps, most are more sensitive to the cognitive understanding of children. The latter emphasize maps of the child's environment--classroom, school, home, neighborhood. These are close to the child and their features are already familiar.

In a classroom, for instance, the objects in the class can be listed: desks, chairs, teacher's desk, cabinet, bookshelves, tables, rugs, fish bowl, sink. Making a list of things in the room is a good cataloging exercise for kindergarten and first grade children. Labels can then be attached to many of these objects. Labelling or naming is a powerful idea with or without Logo. The list of things in the classroom could grow as children make greater and greater differentiation of objects: reading table, science table, art table.

Making a model of the room requires a different kind of problem solving. The teacher can vary the amount and kind of assistance given as well as the kind of model being worked on. The most concrete model would use toy furniture. Since few classes have toy furniture, wooden blocks could be used for a model. The wooden blocks might be borrowed from the kindergarten block corner or from wood scraps. (Beware of splinters in rough wood however.)

A suitable "floor" to work on is something the teacher may want to provide. A floor could be a shallow box such as holds large drawing paper, a piece of paper with a room outline on it, a cafeteria tray, or a table top.

Model Rooms

A wooden model requires several skills. *Size discrimination* is needed to see that the teacher's desk is bigger than the children's desks or tables. Whether exact measurement is important depends on the objectives the teacher has in mind for the project. Some children even at first grade may want the teacher's desk to be twice as big, while other are content with a big block and a small block.

Another skill which is part of model building is a *change of perspective*. Rather than being at the same level as the objects in the class, the student is "above" the objects in the class. "Bird's-eye view" is a difficult but necessary map skill.

Orientation is another spatial skill involved in map making. Which side is the front? Where are the windows and doors? Should be floor be turned so that the map is oriented the same way as the class? While some children may be able to rotate objects 90 degrees or 180 degrees, most need to have the floor pointing the same way as the actual room. Being able to rotate objects in space requires imagery which does not develop until upper elementary grades. The model might be placed in the classroom so that the entire room can be seen while children work on it.

Children may want to tape *labels* on the blocks with names of teacher, student or class pet: Mr. Roarke, Melissa, Fluffy. Now instead of all the desk blocks being the same, they represent discrete places in the room. Order is important. Names have meanings of possession and position.

Tipps continued

Floor Plans

A different level of abstraction is a paper model of the class. Paper squares and rectangles are two dimensional pictures. rather than three dimensional representations, A desk-sized classroom map is made with moveable paper pieces for furniture. One piece of paper could be the floor, while another could be cut up for objects. After work with the wooden model, the students should have fewer problems with this level of map making.

Exact scale maps are not the objective for younger children. By fourth or fifth grade, scale may be important. Then, teacher and children should engage in a measurement project and decide together what size the floor and desks should be on paper. A classroom template for the map might be developed and duplicated.

Turtle Maps

The map activities described are good activities for any classroom. Logo is another tool which can extend and enhance children's facility with map making. Decisions about how best to use Logo as a map making tool depend on the teacher's objectives. student skills, and time available for computer work.

The most wide-open use of Logo would simply be a challenge posed to have students make a map on the screen like the wooden or paper models. Children would need to be able to create procedures for squares and rectangles to attack this problem with success. The list of objects in the room provides the procedure names. One benefit of the list would be emphasize the modular nature of procedures. DESK might be used to draw all the desks in the room. TABLE would also useful for several different shapes.

Positional procedures such as MOVE would also be very helpful. Drawing an arrangement of desks in clusters or rows is much easier with a consistent way to get the turtle over to the next starting place. Children often have a difficult time with changes in location, or state. Understanding the importance of starting and stopping in the same place, or knowing where you are, is more difficult than an actual drawing which can be seen.

Understanding the problems which are likely to be encountered in drawing Logo maps helps the teacher prepare for questions. How should I show doors and window? How big in turtle steps should the desk be? How can I make a row of six desks? Referring to the wooden and paper models is the best answer to most of the questions. Other solutions may involve some cooperative work to write a MOVE procedure or variable procedures.

A different approach would be to provide several Logo procedures for map making tools. Instead of having children write procedures for DESK, MOVE, or ROOM.OUTLINE, the teacher could save a file with these rudimentary procedures already written. The objective in this case moves away from general problem solving and toward map making specifically. The problem for children is not how to make the procedures but how to combine them into an abstract map of the room. The wooden or paper models are still essential experiences to bring to the task.

One classroom map might look like this:
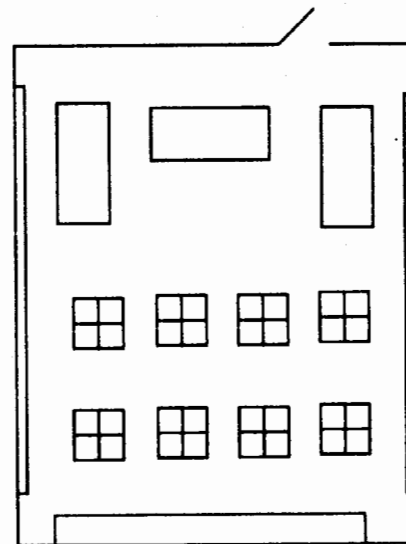
More Room

Even with procedures already written, children have a lot to do to put the pieces together. The basic map can be embellished with many special touches: a fish bowl on the table, an apple on the teacher's desk, the location of the flag. A class project might involve each child drawing a picture of a room in their house or apartment. Then the class could have a tour of rooms or a tour of school with each teacher's room represented. You might get an architect to come and show blueprints for their buildings. Several pieces of software are now available for professional and amateur home planners.

Whether you choose the pure Logo route of having students make maps from scratch or the quasi-Logo method of providing tools, students have a lot of freedom to add to and adapt the basic map In either case, you are making room for a lot of learning with Logo.

Steve Tipps is the West Professor of Education at Midwestern State University in Wichita Falls, TX. He conducts Logo workshops for school systems throughout the United States.

Logo Teacher Feature
by
Rebecca Poplin

Featuring: Leslie Thyberg

"Ask three before me" has become one of the most quoted axioms in Logo teacher lore. With this statement, Leslie Thyberg told her children that they could solve their own problems by working together. (Ed. note: See "Too Many Questions, Not Enough Me," in the May 1985 NLX.) Her confidence in children and enthusiasm about Logo are obvious as she describes her work at the Learning Research and Development Center at the University of Pittsburgh. The school serves as a demonstration site for university classes and as a training facility for educators from other school districts.

Teachers at the Center are creating an adaptive learning environment model. Students in Leslie's K-3 class live in different areas of Pittsburgh and represent a broad spectrum of academic abilities, learning problems, and ethnic/social backgrounds.

During the past school year, excitement was generated by the addition of 15 PCjr's. These IBM computers were a result of Leslie's work with the National Computer Training Institute. Learning a new version of Logo with new features sparked enthusiasm. Music became much more prevalent in the children's work. Students created elaborate versions of "Raiders of the Lost Ark", various Bach tunes, and "The Star Spangled Banner." Creative writing and dramatics blossomed as well. Two girls even choreographed a dance using Logo.

Students were increasingly active as peer tutors. Some who already knew Terrapin Logo acted as dialect translators when IBM Logo came on the scene. These students worked after school in special seminars with the teachers to become turtle trainers. One pointer the turtle trainers were given was: " If you are tempted to touch the keyboard when you are helping another student, sit on your hands." The tutors became especially good at leading others to figure out the solutions for themselves rather than giving the solution. By the end of the year, all students had become turtle trainers and visited another school to teach the students there.

Not only did the students teach other students but the class had parent drop-in days on Fridays. Students taught their own lessons to their parents. Helping parents become familiar with computing and with Logo has been so beneficial that Leslie plans to expand the program this year.

With a major emphasis on integration of computing with other classroom activities, Leslie sets the themes and suggests possible tasks to complete, but she leaves the method to the student. This approach encourages multi-disciplinary projects which are completed at different levels. Squares might be a theme for the class. In the art center, students draw pictures using squares. In writing, they compose stories and poems about squares. On the computer, they create a square project which is either quite simple or very intricate, depending on the student's level. For example, a kindergarten student could make the square with Instant Logo, while a third grader might make a square design using variables.

Many teachers, like Leslie, are seeking ways of using Logo as an interdisciplinary tool. If you have ideas or know a teacher whose ideas would be of interest to others, please contact Rebecca Poplin, 2421 Fain Street, Wichita Falls, Texas 76308.

Rebecca Poplin uses Logo to teach computing and mathematics at a junior high school in Wichita Falls, TX.

NLXionary
A Lectionary of Selected Logo Readings

with Commentary and Opinion
by Griff Wigley

"Logo Today: Vision and Reality," by Uri Leron, *The Computing Teacher*, February 1985.

>This is an important article for theorists and practitioners alike. The author provides a summary of four years' work using Logo with 6th grade students. More importantly, he seems to be one of those rare people who is able to speak knowledgeably about Logo's limitations and difficulties, yet remain enthusiastic about its promise.

>Leron says that the ideal of learning powerful ideas through a Piagetian style of learning poses a paradox in actual practice. If a totally non-directive approach is taken, many children do not acquire the powerful ideas available through Logo. If the powerful ideas are focused on too heavily, alienation and feelings of failure develop. The challenge is to find "more active ways of helping children without sacrificing the spirit of meaningful and exploratory learning." He calls his approach to resolving this tension "quasi-Piagetian learning" (QPL).

NLXionary continued

>He believes this additional structure is needed because he rarely sees children possessing what Papert describes as the burning curiosity and need to understand particular phenomena such as bugs in their programs. For example, they are content to fix bugs without understanding them; they are content to copy procedures without little or no desire to understand how the procedure works. He wonders if children are innately curious and that this is somehow lost over the years in a typical school . (I would argue that the preoccupation with achievement and academic performance as measured by tests are major factors in obliterating children's natural curiosity.)

>Leron describes the use of *QPL* in detail, focusing on the problems and possiblel approaches to teaching subprocedures, modularity, and debugging. He proposes further development of study guides that structure students' learning while preserving the spirit of exploratory and personally meaningful learning.

>This fellow clearly has a solid grasp of the issues facing Logo today. If your curiosity is still alive and you are sincerely interested in understanding and fixing the "bugs" in your Logo teaching approach, get this article and read it soon. I apologize for not alerting you to it sooner.

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

Logo Disserts:
Dissertations
Dealing with Logo

by Barbara Elias

Children encounter a number of bugs as they learn to program in Logo. Removing these bugs (debugging) is an important programming step because it provides the opportunity for a variety of strategies to be used in clearing up errors. An investigation of student debugging was undertaken in an exploratory study involving 20 sixth grade children. The main purposes of the study were to identify and classify the bugs students encountered, identify the strategies they used, and describe their attitudes toward bugs.

Children who used a variety of programming approaches were selected by their teachers to participate. They were 11 to 12 years old and came from three elementary schools of the Edmonton (Alberta) Public Schools. The sample included 9 girls and 11 boys with limited Logo experience. Of the group, 9 were involved in their first year of Logo and 6 had had Logo prior to sixth grade. Following a pilot study, each student was observed while working on programming assignments about four times. The average observation time was two hours.

The study was conducted in 3 different and diverse classroom settings. One classrom had two computers available. Students in the second classroom had access to four or five computers in a room adjoining their classroom and those in the third school used five comptuers in a computer lab.

Programming assignments were provided by the individual teacher in each of the three schools. These incorporated a variety of Logo concepts: procedures, variables, recursion, conditional statements, and many more. Assignments were open ended but varied in the amount of structure. All allowed for discovery, exploration and creativity.

Individual observations, programs on disks, and log notes as well as tape recorded interviews were sources of data. Students were asked to "think aloud" and describe their debugging strategies as they worked. Each completed an attitude questionnaire.

The results indicate that 528 bugs were recorded and were classified into 8 categories. More than half of the bugs involved dimension (31%) or lateralization (18%) errors. Omission (14%) and orientation (13%) bugs were also recorded. More than 1200 strategies were identified. They were grouped into 14 areas with guess and check (41%), and observe and change (12%) having the highest percentages. Some of the other strategies included immediate mode (9%), clear screen and start again (8%), and physical referent (7%). Often, multiple strategies were used with the same bug. The students showed little evidence of detailed prior planning but exhibited strong task commitment and positive attitudes.

The researcher recommends that teachers help children develop new debugging strategies and learn to use those already available to them more effectively.

>>>Cathcart, Gloria M. *Logo Programming Bugs and Debugging Strategies of Grade Six Students.* (Unpublished thesis, Master of Education, University of Alberta, 1985.)

(Ed. note: Each month, Barbara Elias highlights a dissertation or thesis dealing with Logo. She is accepting copies of recent research results for the NLX Dissertation and Thesis Repository. Reports may be mailed to her in care of NLX, PO Box 5341, Charlottesville, VA 22905.)

Barbara Elias is an assistant professor in the Education Department of Virginia State University in Petersburg, VA, and a doctoral candidate at the University of Virginia.

Listful Thinking

by Glen Bull and Paula Cochran

LOGO WORD CHEMISTRY

A chemistry lab can be a fascinating place for young scientists. Test tubes and chemicals allow student investigators to explore laws of nature, and verify that the information in the book is really true.

On the other hand, spelling is rarely anyone's favorite subject. In contrast with the laws of nature that govern chemistry, the rules of spelling appear arbitrary and capricious. Perhaps that's why engineers are notoriously poor spellers. Schools have places where students experiment with chemistry laws, but there's no similar place where students can go to experiment with spelling rules.

In this column, we take a lesson from the chemists and set up a Logo Language Laboratory in which students can experiment with spelling rules and other linguistic laws.

Word Chemistry 101

Strange as it may seem, there is a kind of chemistry in the way words fit together, both for English and for other languages as well. Some sound combinations mix well together, while others don't .... just as different combinations of chemicals produce different results. For example, normally a plural in English is formed by adding *s*. However, if a word ends in *s*, *z*, *sh*, *sh*, or *ch*, you add *es*. *Mat* becomes *mats*, but *mess* becomes *messes*.

The reason that *es* is added becomes clear if you try to pronounce *messs*. It's impossible to pronounce unless you are a member of the Snake People of the Amazon. An English speaker can't say *messs* with a straight face. The spelling rule makes more sense if you understand a principle which underlies it.

Stocking the Laboratory

Linguists construct laboratories in their minds which allow them to experiment with the chemistry of words. In this column, we are going to use Logo to create a similar laboratory for students to use.

A chemistry lab is stocked with chemicals and equipment. We are going to stock our laboratory with the components that make up words. Linguists have categories of speech sounds like chemists have a periodic table which organizes the different families of elements. Some of the names linguists use might seem strange to a chemist, but on the other hand, some of the names chemists uses undoubtedly seem strange to linguists. PLOSIVE is the linguistic name for the type of sound that explodes with a burst of air. We have a Logo procedure containing the plosive sounds in English:

```
TO PLOSIVE
OP PICK [ P T K B D G ]
END
```

(See the end of the column for the PICK procedure listing.)

```
?PRINT PLOSIVE
K
```

Designing Experiments for the Lab

It's unlikely that you would just turn a student loose in the chemistry laboratory to randomly mix various combinations of chemicals together. Instead, projects and experiments are suggested that guide the student's work, and increase the probability that interesting results will occur. (Ed. Note: Also see the NLXionary elsewhere in this issue.)

In the same way, it is necessary to design some experiments for our linguistic lab. The experiment shown below asks the student to use Logo to put together various combinations of sounds that might make up a word.

You will have to type in the procedure LIQUID to do the following example. In addition to PLOSIVE and LIQUID, procedures for other sound categories can also be found at the end of the column.

```
?PRINT ( WORD "S PLOSIVE LIQUID )
STR
```

Results are entered in the table shown below. (Be sure to tell your students about the control key in your version of Logo that retypes the line, so they don't have to type the whole line each time.) This phase of the experiment is the data collection step.

	Letters		Valid Combination?	
S	PLOSIVE	LIQUID		
S	T	R	Yes	No
___	___	___	Yes	No
___	___	___	Yes	No
___	___	___	Yes	No
___	___	___	Yes	No

Number of "yes" trials: _____

Total number of trials: _____

Percentage of valid combinations _____%

After the data is collected, students can begin the data analysis part of the experiment. Students use their knowledge of language to decide whether each combination of sounds is possible at the beginning of English words (the emphasis is on sounds rather than letters.) If there is dissention, you might have the class vote. Then the percentage of valid combinations is totaled.

It turns out that S and a PLOSIVE work well together. In many cases, the sound S, a PLOSIVE and a LIQUID can be combined to form a three-sound combination. In fact, about 50 percent of the combinations work.

	Letters		Valid Combination?	
S	PLOSIVE	PLOSIVE		
S	___	___	Yes	No
___	___	___	Yes	No
___	___	___	Yes	No
___	___	___	Yes	No
___	___	___	Yes	No

Number of "yes" trials: _____

Total number of trials: _____

Percentage of valid combinations _____%

In contrast, PLOSIVEs do not get along with one another. (That is, they don't make good blends.) The second data sheet shows this clearly. The percentage of valid combinations will probably be zero for this work sheet. The following commands are used to explore this combination.

?PRINT (WORD "S PLOSIVE PLOSIVE)
SKG

Once you give students a model or a pattern, they can propose their own experiments. For example, which works better: combinations of FRICATIVEs and NASALs, or combinations of PLOSIVEs and NASALs?

Free-form experimentation can also produce unexpected results. For example, what might happen if we combine an S with a nasal sound and a vowel? If we knew the answer ahead of time, it wouldn't be necessary to do the experiment. Here's what might happen if we tried this particular experiment.

?REPEAT 5 [PRINT (WORD   "S   NASAL VOWEL)]
SMO
SNE
SNGA
SMA
SNO

The combinations SNE and SMA are valid in English. (For example, they can be used to form "sneeze" and "small".) However, SNGA can never be used to form a valid English word. This approach might lead students to conclude that "ng" is never used in initial blends in English.

This way of using Logo for language exploration involves generating lots of examples and appealing to linguistic intuitions to decide which are valid. This approach has two things to recommend it.

• First, it makes the students more aware of the unconscious knowledge of English that they possess. It isn't necessary to memorize everything, because they already possess some of the information simply by virtue of being an English speaker.

• The second thing that is good about this approach is that the students are doing linguistics experiments in the same way that linguists do linguistic experiments. Papert has suggested on a number of occasions that children should do real science, not watered-down substitutes.

Another approach to language exploration relies less on intuition and more on pattern recognition. Using this method, students could look at examples of real English words and try to spot patterns.

Listful Thinking continued

Sounds Like

Thinking about how words *sound* compared to how they *look* provides an opportunity to confirm with students some of the regular irregularities of English spelling. For example, the letters we call "borrowers" are interesting under a microscope. The most obvious are C, X, and Q. They have no "sound" of their own, but simply borrow the sounds usually spelled by other letters. The letter C, for example, borrows the /s/ sound sometimes and the /k/ sound sometimes, depending on the rest of the sounds in the word. The experimenters should think of (or look up) a sample word beginning with each combination.

SC	A	SCAT
SC	E	SCENE
SC	I	SCIENCE
SC	O	SCOPE
SC	U	SCUM

What happens when they get to SCE and SCI? (The sneaky "C" borrows the /s/ sound: no more consonant blend!) When this strategy is used, the teacher has responsibility of salting the list of words with sufficient examples of the concept to permit the student to extrapolate the rule. (In same fashion, a science teacher does not send students out on the playground to collect random samples of elements. Instead, the combinations of chemicals provided for study are carefully chosen beforehand.) Some spellings texts have lists of words which are already organized in this fashion.

Other languages have a different chemistry of sounds. For example, Zbigniew Brzezinski presents an impossible combination of sounds in English, but not in Polish. In English, the combination ZB can never begin a word. In Polish, it can. For a look at the chemistry of the Hawaiian language, see last month's column.

A Rose by Any Other Name

In English, particular combinations evoke certain images. For example, why do *snert* and *smoot* sound funny? If you add a *k*, the combination is even better. For example, *Snookums* can bring a smile. Why does the word *Smurf* appeal to young children?

Another project we could attempt in our linguistic laboratory is creating a Logo program to produce names for a story. If the story is humorous, you might want a program that produces funny names, like the names above. Or you might want to create a program to produce science fiction names, for a story about monsters.

```
TO FUN.NAME
OP ( WORD "S NASAL VOWEL VOWEL PLOSIVE )
END
```

The program might work like this:

```
?PRINT FUN.NAME
SMEOK
```

Of course, the class will have to sift through the examples generated, to decide which ones are usable.

Name generators such as FUN.NAME provide a good entry point for discussions of word choice in creative writing. For example, Tolkien is an acknowledged master of style, and much of the appeal of *The Hobbit* lies in word choice. The reader knows immediately that a creature with the name *Gollum* must be up to no good. Ursula LeGuin's award-winning Earthsea trilogy is another example of children's literature in which not only do the names add richness, but also become an important theme. For younger children the work of Dr. Seuss is a perfect example, with *Grinches* and *Sneeches* abounding.

Components of a Logo Laboratory

A chemistry laboratory has equipment, raw materials, experiments, and lab projects. The laboratory allows students to experiment with concepts that they only read about otherwise.

In our Logo Language Lab, the raw materials are the categories of sounds that can be mixed together (PLOSIVE, NASAL, etc). The equipment consists of Logo procedures such as FUN.NAME which use these sound categories. The experiments described above suggest projects that students can conduct using the materials and equipment found in the lab. These experiments provided by the teacher serve as models for students, who may then create their own projects.

The lab and experiments described in this column have required a minimum of programming on the part of teacher or student. Instead, the emphasis is on language arts content. Discussing the sound system of English in a large group of students can be difficult if there is no way for students to gain experience with the concepts at some point in the lesson. A set of Logo tools makes such exploration possible for students working individually or in teams.

One feature which makes such a lab personally appealing to us is the likelihood of unexpected results. Chemistry labs have liquids and explosives, and our Logo Language Lab has LIQUIDs and PLOSIVEs. The excitement of true experimentation belongs not only in science, but also in reading and spelling instruction.

Listful Thinking continued

Mixing Agents for Word Formation

```
TO PLOSIVE
OP PICK [ P T K B D G ]
END

TO FRICATIVE
OP PICK [ S Z F V TH ]
END

TO LIQUID
OP PICK [ L R W ]
END

TO NASAL
OP PICK [ M N NG ]
END

TO VOWEL
OP PICK [ A E I O U ]
END
```

Logo Tools

```
TO PICK :LIST
OP ITEM (1 + RANDOM COUNT :LIST) :LIST
END
```

In Version 1 of Terrapin Logo, PICK requires the following procedures:

```
TO COUNT :LIST
OP COUNT.LOOP :LIST 0
END

TO COUNT.LOOP :LIST :NUMBER
IF :LIST = [ ] OP :NUMBER
OP COUNT.LOOP BF :LIST :NUMBER + 1
END

TO ITEM :NUMBER :LIST
OP ITEM.LOOP :NUMBER :LIST 1
END

TO ITEM.LOOP :NUMBER :LIST :COUNT
IF :LIST = [ ] OP [ ]
IF :NUMBER = :COUNT OP FIRST :LIST
OP ITEM.LOOP :NUMBER BF :LIST :COUNT + 1
END
```

Glen Bull is a professor in the University of Virginia's Curry School of Education, and teaches Logo courses at both the graduate and undergraduate level. Paula Cochran is a reformed English major who studied linguistics at the University of Cambridge. She is now a speech-language pathologist working with language-disabled children.

TurtleTips

by
Jane Toth and
Donna Lanyi

In Search of the
Disappearing Letter

As we've talked about in a previous column, many students often have difficulties with their typing skills. Some school districts are offering typing courses for elementary age students, while others believe that it is too early to concentrate on structured keyboarding. Whichever philosophy you believe in, it is helpful to have students become familiar with the keyboard to lessen their frustration and increase speed when working with Logo.

The Turtle Teacher

In our November 1984 column, we mentioned utilizing a postersize keyboard, desktop keyboards for students, keyboarding practice books, and a typewriter to strengthen keyboarding skills. We've expanded on these ideas through our own classrooms and with ideas from other teachers.

We enlarged the postersize keyboard into a trifold that is 5 feet long and 3 feet high. The keys are written on separate cards which are attached with velcro. Students love "ripping off" the keys and making a game out of who can replace the most keys correctly or the quickest. Normally we ask the students to concentrate on certain keys for a given period of time - home row keys, primitive command keys, special CONTROL keys, etc. We've seen this same idea done bulletin board size using styrofoam hamburger boxes for each key. This is a great manipulative activity.

Lucky us! Our PTO painted a giant keyboard on the playground! We use it for class activities, and the children love to jump out Logo commands during recess!

A bingo type game where students mark off the letters on individual keyboards is an old idea rejuvenated. We also supply blank dittoed keyboards for students to practice filling in.

One teacher invented "Swat a Key." Primary students were divided into two teams and each team was given a fly swatter. As a letter was randomly called out, the team member to swat the key on an enlarged keyboard first scored a point for his or her team.

TurtleTips continued

Don't forget commercial software that develops typing skills. Students always love to practice a concept at the computer. Also, programs such as *MasterType* (Lightning Software, Inc.) allow you to set up a list of your own words for student practice. Special Logo primitive sets or groups of longer command names might be good candidates.

Procedure of the Month

Logo is bewitching! Have students design Halloween witches, masks, or creatures in Logo for bulletin boards, hall displays, party favors, or maybe even their own costumes! If you are interested in a listing of the procedures for the drawing below, please send us a self-addressed stamped envelope.
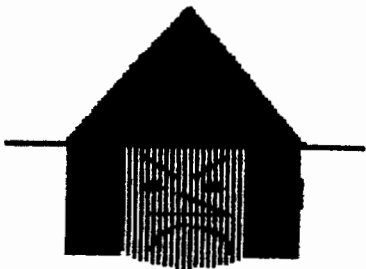
We invite any teachers or elementary students to send Logo procedures or ideas to be shared in this NLX column. Jane Toth and Donna Lanyi, Beall Avenue School, 716 Beall Avenue, Wooster, OH 44691.

Jane Toth and Donna Lanyi use Logo in their elementary classrooms in the Wooster (OH) City Schools.

Logo Notes

Kaleidoscopes, an outstanding Logo newsletter for experienced users, made its debut in May. Its editorial staff includes Alison Birch (co-founder and former director of The Phoenix School), Larry Davidson (author of the Apple Logo Reference Manual), and Phil Lewis (mathematics teacher at Lincoln-Sudbury High School) *Kaliedoscopes* is published bimonthly, and includes articles on applications of Logo at the intermediate and advanced levels, ideas for using Logo in secondary classrooms, and regular columns covering topics of interest to all Logo users. For more information, write to Kaleidoscopes. Computers for a New Education, 57 Waverly Street, Suite 100. Belmont. MA 02178.

Open-Apple is a monthly newsletter dedicated to providing full information about the ins and outs of the Apple family of computers to everyone. Each issue is packed with technical details and hints, tips on how to identify and fix bugs, and much more. If you are "into" Apple II computers, then you should subscribe to this outstanding newsletter. The editor is Tom Weishaar. To subscribe, send $24 to Open-Apple, 10026 Roe Avenue, Overland Park, KS 66207.

Back issues of *The National Logo Exchange* newsletter are available in sets. Volume 1 (September 1982 - May 1983), $15. Volume 2 (September 1983 - May 1984), $20. Volume 3 (September 1984 - May 1985), $25. Order from NLX, PO Box 5341, Charlottesville, Va 22905.

The NLX Research Directory is available for distribution. It contains the names and addresses of educators who are conducting Logo related research, and includes summaries of their work and interests. To obtain a copy, send a check for $3 to NLX Research Directory, PO Box 5341, Charlottesville, VA 22905.

Copies of the *Logo 85 Preproceedings* and *Logo 85 Theoretical Papers* are available for $15 per set. Send a check (payable to MIT Logo Group) to Logo 85 Preproceedings, MIT AMT, E15-309, 20 Ames Street, Cambridge, MA 02139.

Terrapin Inc. has Terrapin Logo version 3.0 available in packs of 10 ($299.95) and 20 ($525.00) language disks. An upgrade to version 3.0 is available for owners of version 2.0 for $20 per disk. For more information, contact Terrapin, Inc., 222 Third Street, Cambridge, MA 02142, or call (617) 492-8816.

Apple Computer, Inc., announces that both Apple Logo and Apple Logo II can be purchased in packs of 10 for the education price of $280. For more information, see your local Apple dealer.

Posy Lough's new book, *Christmas Decorations: Turning Family Treasures into Traditions*, contains instructions for making a wreath from Lego™ blocks. This decoration was inspired by the enthusiastic Logo activities of the children using Lego™ during the Logo 85 Conference. Other ideas from the book will be featured in the December issue of *Guideposts* magazine. To order a copy of the 40-page book, send a check for $5 (made out to The Posy Collection) to Christmas Decorations, PO Box 5341, Charlottesville, VA 22905.

Teacher to Teacher
A Review of New Logo Materials

by Anne Cairns Federlein

As we become entrenched in Logo this new school year, it is important to look at how Logo has affected the total school curriculum. Is Logo taught independently of other subjects? Has it has an effect on the teaching of other academic subjects in your school?

As students are encouraged to learn by discovery in Logo and to learn from mistakes in problem solving, a new way of thinking evolves for many children. It is my hope that educators will see changes in the children and convince administrators to allow the Logo philosophy to become an integral part of the total curriculum.

The following new texts have been reviewed for your classroom.

Beginning Students

Logo for the Apple II/IIe/IIc, by Maryann Marrapodi, 1985, published by Random House, 201 East 50th Street, New York, NY 10022.

Target Audience: upper elementary children

Content: The workbook includes chapters on Meeting the Turtle, Designing with the Turtle, Teaching the Turtle, and Circles and Colors. These are followed by Variables, Using Recursion, Turtle Stars and Spinsquares, Recursion and Spirals, and Turtle Projects. Chapters on Logo Words and Numbers, Lists and Sentences, and Using Conditionals round out the offering.

Strengths: The sequential format begins with introducing upper elementary children to the turtle. This workbook gives useful questions to ask the children during each chapter. It also allows the teacher to present information on Logo in the classrooom without every child using a computer. However, this method of teaching can be dangerous! Children learn by doing -- not by answering abstract questions in a workbook. Sufficient classroom time must be allocated for children in small groups, or individually, to play on the computer.

Teachers of early elementary children should use the book as a teacher's edition and simplify the instructions and questions. Older children will find the book stimulating, and the examples challenging. Teachers, even the novice, will find the book easy to understand.

Older Beginning Students

Apple Logo for Kids, by David A. Yule, 1984, published by Tab Books, PO Box 40, Blue Ridge Summit, PA 17214.

Target Audience: middle and high school students, Logo teachers, and parents

Content: The turtle is named Sam and appears in chapters such as: An Introduction to Parents, Teaching Sam How to Do Things, What to Do If You Are Stuck, If You Don't Type Well, You Will Love This!, Using Color with Sam, and Telling Sam to Tell Sam to Tell Sam ...

Strengths: This book makes learning Logo fun for both the student and teacher. The immediate technical and curricular concerns of the beginning student and teacher are addressed in a playful manner by naming the turtle Sam, and by giving the chapters titles that capture the imagination. (Can you guess what the "You Will Love This!" chapter is about?)

The format of the text does not have the workbook appearance of many beginning Logo books. The written text is high level and the authors have discussed all the practical concerns of beginners in easy-to-understand language. Each chapter contains a drawing of a watchdog marking important information to remember.

Questions and crossword puzzles give the student and teacher an opportunity to review the information presented in the chapter. These reinforcement activities are typical of the ones used in schools today and, all too often, replace class discussion. Teachers should remember the value of children learning through their mistakes, rather than recording pat answers to the rote questions. We run the risk of making Logo just another school subject with drill and practice activities for learning.

The appendices contain a useful parent's guide and information on how to get started with both Apple and Terrapin Logo, along with equivalent commands and keystrokes to "translate" from Apple Logo to Terrapin Logo, TI Logo, and TRS-80 Color Logo. This text is very useful for introducing older students, teachers, and parents to Logo.

Do you know of any new Logo materials and books? Did you find them useful in teaching? If so, we invite you to send information to The Logo Information for Teachers (LIFT) Group, PO Box 5396, Plymouth, MI 48170.

Anne Cairns Federlein is a professor in the Early Childhood Area, School of Human and Educational Services, Oakland University, Rochester, MI.

Q and A

by
Jim
McCauley

Q. I'm used to programming in BASIC, and though I think Logo is a great language, I really miss having arrays to work with. Why doesn't Logo have arrays?

A. Arrays closely match the BASIC and FORTRAN models of what a computer is: a register machine. That is, data of highly restricted types in highly restricted formats are stored in address locations which (usually) are contiguous in the machine. For example, if you want to store a list of 16-bit signed numbers in a register machine, a very natural way to do it is to store them in immediately adjacent pairs of bytes in memory. They can be accessed very conveniently (and quickly) by means of an index; in BASIC, one would recall the third element in an array called "ARRAY" by calling ARRAY (3).

Conveniently, most array-processing languages (such as BASIC, FORTRAN, and Pascal) make provisions for accessing elements of multi-dimensional arrays, thus greatly simplifying the problem of constructing tables. For example, one could reference the third element of the second "list" in a two-dimensional array called "ARRAY2D" by referencing ARRAY2D (2,3).

Array with Logo

In Logo, though, information is stored in linked lists, and construction of an index is (usually) difficult or impossible. Instead of accessing items in lists by reference to indices, the usual method in list-processing is to decompose a copy of the list recursively until the item desired is reached. Arrays may be simulated through the use of the ITEM primitive, and multi-dimensional arrays may be constructed from "lists of lists."

Changing contents of such a simulated array, however, will always require the use of recursion. This might sound terribly inconvenient, but it actually makes a lot of sense. In an array processor, you must concentrate on manipulating pointers (indices), but in a recursive list processor, you are manipulating the data *directly*.

Thus, a level of potentially confusing indirections is eliminated.

Up, Up and Array

There are two versions of Logo in which arrays have been implemented: *ExperLogo*, a compiler from ExperTelligence (559 San Ysidro Road, Santa Barbara, CA 93108. See the May 1985 NLX for a brief review.), and *[TLC] Logo*, from The Lisp Company (430 Monterey, #4, Los Gatos, CA 95030. Also see *Thinking about [TLC] Logo*, reviewed in the March 1984 NLX.) [TLC] Logo implements arrays as vectors, a very sophisticated technique borrowed from another computer language called APL.

I hope this background information gives you encouragement to "play around" with lists of lists and recursion in Logo.

Each month, I will answer selected questions in this column about Logo programming techniques or the thinking which leads to programming. If you have a question, send it to: Jim McCauley, 876 East 12th Avenue, Eugene, OR 97401. Please enclose a self-addressed stamped envelope.

Jim McCauley is a graduate student at the University of Oregon, studying with David Moursund, and has written Logo articles for many national publications.

LOGO NOTES

The first *World Logo Conference* is scheduled for October 25 - 27, 1985, and is an event you shouldn't miss! Offered through CompuServe, the conference makes it possible for you to participate without leaving home. Online panel discussions with well known Logo workers will be featured, in addition to other activities. Panelists include Seymour Papert, Molly and Dan Watt, David Thornburg, Brian Silverman, Jim Muller, Judith Pope, Rina Cohen, Dale Burnett, Bill Higginson, Uri Leron, Paul Goldenberg, Tom Lough, and many others. Participants from many countries around the world are expected to log in during this electronic festival.

If you are already a CompuServe member, registration is $15. Otherwise, the cost is $55, and includes a CompuServe membership. It is necessary to use a modem to participate in the conference (and other CompuServe activities). For more information, write to World Logo Conference, 1616 Charles Street, Vancouver, BC Canada V5L 2T3.

Are you looking for a new dimension to your teaching this year? The *Logo Class Penpal Network* may be just the thing! By sending in an application, you and your class will be matched with a counterpart from the USA, Canada, or perhaps one of several overseas countries, based on grade level, computer compatibility, Logo experience, and interests. During the school year, students and teachers exchange Logo ideas, procedures, and projects. For a free application, send a self addressed stamped envelope to Logo Penpals, School of Education, University of Virginia, 405 Emmett Street, Charlottesville, VA 22903-2495.

NLXual *Challenges*
by Robs Muir

The BASIC Challenge

This NLXual Challenge is unique in several ways. First, unlike all previous Challenges, I know currently of no existent solution. (Have I sparked your interest?) Second, this Challenge presents a potentially more complex and lengthy project than those during the past two years. Thirdly, this project's solution may present the most compelling answer yet to my students' questions about when "...will we begin to learn BASIC?" So, it is with a mixture of computational revulsion and perverse curiosity that I present this month's Challenge.

Back to BASIC?

I think the most difficult Logo Challenge I've faced as a teacher has been the one posed by several of my students at least once every year. Perhaps you've experienced it in your Logo classroom. The scenario runs something like this.

After months of careful planning, you've finally managed to create the perfect Logo environment, one rich in student-initiated learning activities that integrate your curricula into your students' lives and, incidentally, one that makes much use of the computer (or computers) in the back of your classroom. Every kid is having a ball and your level or creativity has never been higher.

Then dawns that fateful day when the bubble bursts and the spectre of "computer literacy" rears its ugly head ... the day when your "hottest" 10-year-old Logo programmer asks,"Teacher, when are we going to learn BASIC?"

Of course, you try to explain Dijkstra's warnings about GOTOs, the power of procedural / functional description, recursion, lists as data structures, Lambda calculus, etc., but you begin to sense that your remarks are falling on deaf ears. After all, your young inquirer has read some books on computers (all written for BASIC users), and his or her older friends all know BASIC. They have computers at home (which have only BASIC, because who can afford a Logo disk), and besides, they're taking "computer" in high school (where they teach only BASIC!).

Can you blame your student for wanting to "graduate" to a perceived higher level of programming? The "samba school" of the street is overwhelmingly in support of line numbers.

Where is the really convincing demonstration of Logo's expressive power that a fifth grader can understand? I've been searching for such a demonstration since I began to notice this adolescent preoccupation ith QWERTY languages to the exclusion of better tools like Logo. The solution to this month's challenge may well be it!

Brian's Sparks

Brian Harvey's new book, *Computer Science Logo Style,*(MIT Press, 1985) contributed two sparks that ignited this Challenge.

* Spark number one: As a pedagogic trick, Brian suggests a Logo demonstration during that first lecture. In the first few weeks, new Logo students can't be too inventive with a new language; "That's the one reason I like to start by showing off a more complex project the first day. It helps me convince the students to have faith in me for the first week or two while they're limited to trivial projects themselves."

* The second spark is found in Brian's "sneaky greeting."

```
TO START
CLEARTEXT
PRINT [ WELCOME TO LOGO. ]
TYPE "?
PR SE [ I DON'T KNOW HOW TO ] FIRST SE RL
TYPE "?
WAIT 100
PRINT [ HA, HA, FOOLED YOU!! ]
END
```

Do you see the challenge yet? What better way to show the power of Logo to an incorrigible BASIC fan than to write a complete BASIC interpreter in Logo! Can we do it? Intuitively, I'd say, "SURE!" But I'm still working on it.

First, we've got to get rid of those overly informative Logo error messages; how unBASIClike! If your Logo implements CATCH and THROW (look these up in your Reference Manual), you might try this:

```
TO BASIC
CATCH "ERROR [ RUN.COMMAND ]
PR [ SYNTAX ERROR ]
BASIC
END
```

Challenge continued

```
TO RUN.COMMAND
TYPE CHAR 93
RUN READLIST
RUN.COMMAND
END
```

This program, BASIC, will run Logo just fine, except the old Logo prompt (the "?") will be replaced with a "[". However, we will always get a rude SYNTAX ERROR statement if we type something like FORWORD 100. (By the way, a CONTROL G won't abort this abomination of a program; use THROW "TOPLEVEL.)

Interpreting BASIC

I suppose the ultimate challenge here is to write a complete BASIC interpreter in Logo that would run any standard Microsoft BASIC program. There are a host of related complexities you'll discover as you tackle this project. It may not be possible on an Apple, a TI, or an Atari, due to memory space. But imagine the possibilities with an IBM PC, an Atari 520ST, a Macintosh, or an Amiga.

On January 1, 1986, The National Logo Exchange will award a free copy of Brian Harvey's new book to the most complete (e.g., best Sieve of Erathosthenes benchmark) BASIC/Logo interpreter. Reprints of all past NLXual Challenges will be awarded to the most complete 6502 implementation. So much for intrinsic motivation!

Send your completed program listing, with a stamped self-addressed envelope to

NLXual Challenges
Attn: Robs Muir
1688 Denver Avenue
Claremont, CA 91711

We will send copies of the winner's solutions to all contributors. In addition, if you would like to suggest an NLXual Challenge for other NLX readers, send your problem to the above address.

```
10 PRINT "FORWARD 100"
20 END
```

Robs Muir is a teacher in the Claremont CA Unified School District and Claremont Graduate School.

Imagewriter Overprinting Fixed!

Thanks to Mark Eckenwiler of Terrapin, Inc., for furnishing this Terrapin Logo procedure which prevents the Apple Imagewriter from overprinting long lines in Logo procedures. Type in the SETUP procedure, turn your printer on, run the SETUP procedure, and then print out your other procedures in the usual way. (Ed. note: See "Imagewriter Overprinting?" in the September 1985 NLX.)

```
TO SETUP
OUTDEV 1
(PRINT1 CHAR 9 "C CHAR 13 )
OUTDEV 0
END
```

Steve Tipps wrote and tested this corresponding procedure for Apple Logo.
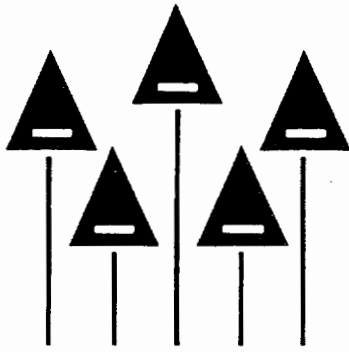
```
TO SETUP
.PRINTER 1
(TYPE CHAR 9 "C CHAR 13)
.PRINTER 0
END
```

Logo Note

The *West Coast Logo Conference* is being held November 21 - 23, 1985, at the Pacifica Hotel in Culver City, CA. Many panels, discussion sessions, workshops, and presentations are planned to make this one of the major Logo events of the year. Send now for your registration materials. West Coast Logo Conference, Pepperdine University, 3415 Sepulveda Boulevard, Los Angeles, CA 90034.

NLXtra

A Supplement to the National Logo Exchange Newsletter

Logo Notices

The Young Peoples' Logo Association has gone electronic! If you are a member of CompuServe, be sure to visit the Logo Forum, a veritable electric Logo kingdom, with lots of goodies and treasures scattered about! From any ! prompt, type GO LOGOFORUM. If you have been looking for a reason to join CompuServe, here it is.

Ideas y Formas, a Logo book by Horacio Reggini published in Spanish, explores the concepts of shapes in space: their description, generation, and manipulation. For more information, write to Emece Distribuidora, Alsina 2062, 1090 Buenos Aires, Argentina.

Celia Hoyles, of the London University Logo Group, announces the availabilty of the following publications on Logo. (All prices are listed in English pounds due to the uncertainty of the monetary exchange rates.) *The Interim Report on the Logo Mathematics Project 1983-4*, £8.50 plus postage and packing: £7.06 air mail or £2.10 surface mail. *Proceedings of the Logo and Mathematics Education Conference, March 1985*, £5.00 plus postage and packing: £7.06 air mail or £2.10 surface mail. *Creating a Mathematical Environment through Programming: A Study of Young Children Learning Logo*, by Richard Noss, £10.00 plus postage and packing: £10.00 air mail or £5.00 surface mail.

Computer Technology for the Handicapped, a conference sponsored by Closing the Gap, will be held October 30 - November 2, at the Radisson South Hotel in Minneapolis, MN. Pre-conference workshops, over 100 presentations (including several on Logo), and a wide range of exhibits are scheduled. For more information, write to Closing the Gap, PO Box 68, Henderson, MN 56044.

The World Congress of Education and Technology will be held in Vancouver, British Columbia, May 22 - 25, 1986. The program contains a "who's who" of educational computing, and promises many exciting Logo events for the expected 10,000 attendees. Make plans now to attend this global event! Write to Anne Marx, WCET, 1155 West 8th Avenue, Vancouver, BC V6H 1C5 Canada, or call (604) 734-2721.

The sixth annual *Microcomputers in Education Conference* is scheduled for March 12 - 14, 1986, at Arizona State University in Tempe, AZ. The theme is "Ethics and Excellence." For more information, write Janie Hydrick, Payne 216, College of Education, Arizona State University, Tempe, AZ 85287, or call (602) 965-7363.

The *National Educational Computing Conference* (NECC 86) is scheduled for San Diego, June 4 - 6, 1986. Hosted by the University of San Diego, NECC 86 will offer Logo users many opportunities for meeting and sharing. Program proposals and papers are accepted until November 1, 1985. For more information, write to NECC 86, University of San Diego, School of Education, Alcala Park, San Diego, CA 92110.

The *Journal of Computers in Math & Science Teaching* (JCMST) is beginning its fourth year of publication, and now offers an expanded format to its subscribers. A regular Logo column is included, along with articles, reviews, listings, and announcements. The JCMST is published quarterly at $18, and is devoted to the use of computers in mathematics and science teaching at all levels. For more information, contact Mary Marks, JCMST, PO Box 4455, Austin, TX 78765. (512) 244-1771.

Computers in the Schools has published a special double issue, *Logo in the Schools*. The 300+ page volume contains 30 articles by well known Logo workers, including a feature article by Seymour Papert. This highly recommended volume is available for classroom adoption at $7.95 per copy. A minimum order of 5 copies is required for this special price. Haworth Press, 28 East 22nd Street, New York, NY 10010-6110.

The outstanding NOVA public television program, "Talking Turtle," is now being distributed in 16mm film and video cassette formats by The Media Guild. An overview of Logo, an interview with Seymour Papert, and Logo applications in a variety of settings are featured in the 48-minute film. For more information, write The Media Guild, 11526 Sorrento Valley Road, Suite J, San Diego, CA 92121, or call (619) 755-9191. (Ed. note: See the December 1983 NLX for a review by Andrew David.)

The Atari Teachers' Network publishes a quarterly newsletter with loads of tips and information. A recent issue contained a review of PRINTWIZ (Allen Macroware, PO Box 2205, Redondo Beach, CA 90278, $29.95), a disk based graphics screen dump which works with the Atari Logo cartridge and a number of different printers. To subscribe, send $4 to John Hanna, Editor, Atari Teachers' Network, Teaneck High School, 100 Elizabeth Avenue, Teaneck, NJ 07666.

NLX reader John L. Earnest of Garden City, NY, reports an unexpected result when using an input value of 1.5 with the ARCTAN operation of Apple Logo.

PRINT ARCTAN 1.4
54.4626
PRINT ARCTAN 1.5
62.9897
PRINT ARCTAN 1.6
57.9953

A further curiosity is as follows.

PRINT ARCTAN (1.0 + 0.5)
62.9897
PRINT ARCTAN (1.4 + 0.1)
56.3105 (the correct value!)

Be aware that this bug exists, and that Apple Logo calculations using ARCTAN with an input near 1.5 may be subject to error. ARCTAN in Apple Logo II and Terrapin Logo appears to work properly in this range.

Students of Robin Conrad, a teacher in New York City, use SETSCRUNCH with their NLX ABC's to vary the proportions of the letters. Robin also suggests using negative numbers as inputs for the letter sizes to explore symmetry in a surprising way. For a free listing of the procedures to draw the letters of the alphabet, send a self-addressed stamped envelope to: NLX ABC's, PO Box 5341, Charlottesville, VA 22905.

A number of Spanish Logo versions are available from Chile. For information on Spanish Logo for the Apple and Atari, write MDS, S.A Victoria Subercaseaux 191, Dpto. 201, Santiago, Chile. A Spanish Logo for the Commodore is available from Andromeda Computacion Ltds., Manuel Montt, 037 Local 10, Santiago, Chile.

ExperTelligence announces ExperLogo 1.1, an upgrade to their ExperLogo 1.0 with more features and some bug fixes. Additional features include user definable menus and window manipulation from program control and the inclusion of ERALL and CLEARTEXT commands. The company has also announced ExperLogo-Talk, a program written in ExperLogo which adds *speech* to the Logo capabilities of the Macintosh. It requires 512K and an external drive, and sells for $49.95. For more information, write to ExperTelligence, 559 San Ysidro Road, Santa Barbara, CA 93108, or call (800) 969-7874.

Logo users in central New York state are invited to join ASTROLUG, the Albany - Schenectady - TROy Logo Users' Group. For more information, write to Peter Rawitsch, PO Box 254, Guilderland Center, NY 12085, or call (518) 861-6637.

BIKILOG is short for Big Kids Logo Group, an organization formed to give Australian Logo users of all ages an opportunity to meet and interact. For more information, write BIKILOG, Box 88, Balaclava 3183, Australia.

Chris Templar would like information from anyone on techniques to move Commodore Microillustrator files into Commodore Logo. If you know a method to do this, please correspond with Chris Templar, Department of Computer Education, Johnson Bible College, Knoxville, TN 37998.

A free author's guide to writing articles for the NLX is available. To obtain your copy, send a self addressed stamped envelope to NLX Author's Guide, PO Box 5341, Charlottesville, VA 22905.

Learning Ukranian with Logo is a software development in Sprite Logo by Ihor Charischak. If you are interested in participating or would like more information, send for a free brochure. Ihor Charischak, Logo Computer Systems, Inc., 555 West 57th Street, Suite 1236, New York, NY 10019. (212) 765-4780.