LOGO EXCHANGE

International Council for Computers in Education

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Materials for Classroom Teachers
and Teacher Trainers

Edited by
Theodore C. Burrowes and Sharon K. Burrowes

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LOGO EXCHANGE

CONTENTS

The *Logo Exchange* is produced on a Macintosh SE and Laser writer donated by Apple Computer, Inc.   (LOCAL "PAGE)

From the Editor

Together we did it!

Did you ever believe in September that you would see nine issues of *LX* this year? Just as a celebration seems in order, I find myself busy with the September issue!

Putting the *Logo Exchange* together this year has been challenging, exciting, and humbling. At times it seemed that there would be no material for the next month — just when I was *sure* disaster was imminent, my mailbox would be full of articles from dedicated columnists and authors.

But I have been only one small part of the process. I want to take this opportunity to publicly thank all of those who contributed to *LX* this year. First and foremost, I want to thank ICCE. Without their willingness to provide *LX* a home and dedicate some of their already over-taxed staff time to producing *LX*, it most certainly would not exist. I especially want to thank Anita Best, editor of *The Computing Teacher*, for her expert advice, assistance, and friendship through what has been at times a difficult year.

Of course, without the loyal columnists who somehow managed to find the time in their busy schedules to put together a column nearly every month, the pages of *LX* would have been blank. There are not words to express my appreciation.

I also want to thank Tom Lough for his continuing support and advice as I feebly attempted to fill his shoes. In the midst of his very busy schedule this year, he found time not only to answer questions at the "drop of a hat," but also to continue his lively "editorials" throughout the year.

Although only a little has been said about the SIGLogo officers, you who are members of this new organization need to know that they have spent a lot of time putting together the SIGLogo out of which *LX* grows. I especially want to thank Peter Rawitch for his constructive criticism that helped me constantly work towards improvement of *LX*.

I've particularly enjoyed putting student work on the cover of *LX* this year — I think it's an interesting window into what is happening in classrooms all over the world. I want to thank my son, David Burrowes, for that spontaneous and delightful idea. I hope we can continue this "tradition" next year.

One of the little-known crises in the production of *LX* occurred between my preparation of the copy to send to ICCE and the printing process. To make a long story short, getting *LX* onto PageMaker became a seemingly insurmountable bottleneck: Robs Muir to the rescue. Certainly you have noticed *LX*'s "new" look — if you didn't take note

before, look again. We have Robs to thank for his willingness to take the time to develop the new template and to lay out the issues since January. Thanks Robs — I know it wasn't easy!

Certainly there are many others that I haven't mentioned here — the kids who sparked ideas, the spouses who put up with our long hours, the staff at ICCE who answered innumerable questions about where on earth someone's *LX* was... If I have forgotten you, my apologies. Your contribution large or small is appreciated by us all.

As of this writing, SIGLogo is alive and well. What it needs now is to thrive. With summer at hand, perhaps you now have some time for reflection that was missing through a busy year of lesson plans, meetings, and papers to grade. How about sharing your thoughts, your ideas, your discoveries, your expertise? Write an article for us — you don't have to be an expert — we'll help you refine it. How about contributing some of your students' work for the cover? Encourage a colleague to join SIGLogo. Encourage your school library to have *LX* on its shelves. Our memberships provide the funds to allow you to receive *LX*. Without a growing membership, *LX* will not be able to move towards better meeting your needs. Make it your personal goal to encourage at least one colleague to join *SIGLogo* this summer.

One final note may be of interest to you about production of *LX*. Throughout this entire year I have used my keyboard to enter fewer than a half dozen articles. Almost all of *LX* comes to me in electronic form. Perhaps even more amazing is that nearly half of *LX* comes via CompuServe. The articles come on disk done on AppleWorks, AppleWriter, Bank Street Writer and MacWrite. They come over CIS as text files or as Macintosh files complete with pictures. Logo files come on disk or over CompuServe ready for me to run in order to create pictures for *LX*. I have had to learn a good bit just to access all of these formats. In this amazing information age, it is of particular interest to me that those who contribute to *LX* are indeed involved in experimenting with new ideas in computer education besides Logo — that they are continuing to grow and encourage others to grow.

Sharon Burrowes Yoder, ICCE/SIGLogo, University of Oregon, 1787 Agate Steet, Eugene, OR 97405-9905

Cover: Jessica Gill, grade 4, had less that 10 weeks of LogoWriter when she created this scene. She is a member of the Resource Enrichment Program, Conover Road School, Colts Neck New Jersey.

Monthly Musings

Turn, Turn, Turn
by Tom Lough

In January, I wrote about a trip to the toy store with Kyser, my four-year-old son. For control [and sanity] purposes, I placed him in a shopping cart. But I moved the cart wherever he wanted to go, provided he used the commands of FORWARD, RIGHT, and LEFT to give me instructions.

At first, he pointed "over there" and said "RIGHT! RIGHT!" with the expectation that I would move the cart "over there." But then he began to realize that the RIGHT and LEFT commands produced only a turning, with no other motion. So he started to use RIGHT and LEFT to "aim" the shopping cart before giving the FORWARD command to set the cart in motion.

After writing about that trip, I have thought more about the idea of turning. I remembered an incident from one of my early Logo teaching experiences. I was working with a 6th grader in her first encournter with Logo. The turtle was pointing toward the bottom of the screen. She said she wanted to get it to move to the right side of the screen, and typed

```
RIGHT 90  FORWARD 100
```

She gasped when the turtle turned toward the left side of thescreen instead and moved in that direction. Only after considerable discussion and "walking it out" did she begin to start thinking about the effect of the Logo commands with respect to the orientation of the turtle itself.

The two incidents described above suggest different aspects of the concept of turning. One aspect might be that a turn command produces only a spin or reorientation of the heading, and no displacement or movement. Another is that a turn command operates with respect to the orientation of the turtle, and not with respect to the orientation of an external fixed frame of reference.

Although these ideas have been described reasonably well in the popular Logo books, I was pleased to see them appearing more and more in the professional literature. An example of a recent article is "Children's Naive Conceptions and Confusions About Logo Graphics Commands," by Anne Louise Fay and Richard E. Mayer, published in the *Journal of Educational Psychology*, 1987, Vol. 79, No. 3, pp. 254 - 268.

The Fay and Mayer article focuses on the possibility that children bring to the Logo environment a set of naive conceptions of spatial reference which may hamper their learning. In particular, they suggest that an undiscriminated conception of commands will hamper children from learning that the RIGHT and LEFT commands do not move the turtle, but only turn it, and that an egocentric conception of space will make it difficult for children to view the effects of the RIGHT and LEFT commands with respect to the orientation of the turtle. These two conceptions, of course, correspond directly to my experiences with Kyser at the toy store and with the 6th grader.

What can be done to help children understand that these conceptions may need refining? Perhaps some ideas to extend existing exercises and projects might be worth thinking about. For example, in Chapter 12 of his classic book, Learning with Logo [Byte / McGraw-Hill, 1983], Dan Watt develops and uses a set of procedures to allow a student to "drive" the turtle around a track. Here is a modification of these procedures which might provide some additional possibilities for beneficial exercises. [You will need to add a feature to stop the DRIVE procedure in some fashion.]

```
TO DRIVE  :DISTANCE  :DELAY
COMMAND  :DISTANCE
WAIT  :DELAY
DRIVE  :DISTANCE  :DELAY
END
```

LCSI:
```
TO COMMAND  :DISTANCE
IF KEYP  [ MAKE "COM  READCHAR ]
         [ FORWARD :DISTANCE STOP ]
IF :COM  =  "R  [RIGHT 30 STOP]
IF :COM  =  "L  [LEFT 30  STOP]
END
```

Terrapin:
```
TO COMMAND  :DISTANCE
IF RC? THEN  MAKE "COM  RC
     ELSE  FORWARD :DISTANCE STOP
IF :COM  =  "R THEN RIGHT 30 STOP
IF :COM  =  "L THEN LEFT 30  STOP
END

TO WAIT  :DELAY
REPEAT  :DELAY  [    ]
END
```

By typing something like

`DRIVE   3   0`

a student can steer the turtle with the L and R keys. In so doing, he or she would be gaining experience with the concept of how the LEFT and RIGHT commands work with respect to the turtle. Later, inputs such as

`DRIVE   3   100`

can provide the delay necessary so that the student can more easily see that the LEFT and RIGHT commands perform only a turning function, and do not contribute to the actual displacement of the turtle other than to influence the direction of the motion.

The DRIVE procedure provides a turtle with characteristics similar to those of a toy car or tricycle or other vehicle with which the student may be familiar. Perhaps by giving opportunities for additional experiences, such as those provided by the DRIVE procedure or perhaps by a set of procedures you conceive and write, naive conceptions can be altered so that Logo learning can proceed in a more direct and effective manner.

Finally, we must not forget the value of concrete experiences in the sequence of learning. Having children ride in shopping carts or chairs with rollers and experience the effects of the turn commands provide additional opportunities for them to re-evaluate these concepts in their own way.

RIGHT 90 LEFT 90 FORWARD 100!

Tom Lough, Box 5341, Charlottesville, VA 22905

Logo Ideas

SPRING!
LogoWriter as a
Gardener's Tool

by Eadie Adamson

"Could I use LogoWriter to plan my garden?" asked Louise.

"What a neat idea! Of course you could!" I said. "I'll play with the idea over the weekend and give it to you on Monday."

Louise Santoro, our librarian, has been working with computers for a few years and has learned a great deal on her own. Because my classroom is directly opposite the library, Louise has been able to see all the Logo work going on and has begun to teach herself to use LogoWriter, occasionally consulting with me or sitting in on some of the elementary classes. The question about using LogoWriter for garden planning was thus not an idle question, since it came from someone who was beginning to see what could be done with LogoWriter.

LogoWriter turns out to be ideally suited to such a project. In fact, the idea has curriculum applications outside the particular problem Louise and I were thinking about. Young students are sometimes asked to plan an ideal room of their own or a new arrangement of their classroom. Sometimes they are asked to draw up a plan of a neighborhood, perhaps as a follow-up to a fact-gathering tour. Perhaps they are asked to make a drawing of the street on which the school building stands. LogoWriter hooks into these projects in a very easy and natural way, since it is possible to design your own shapes and to stamp the shapes on the screen. It is not difficult to create a program which helps in this task, one which can be changed easily to incorporate new shapes as well.

Since LogoWriter also can access other pages, such a program, whether addressing gardening or city planning, can also keep information about the "picture page" on other pages of the disk, creating a sort of reference or data bank of information about the project.

Thinking It Out

My first step was to present the idea as an exploration for my upcoming LogoWriter Curriculum Workshop for teachers. My thinking about how to put this together *before*

I tried to do so proved to be very worthwhile, because with such advance planning the programming took me less than half an hour to complete.

The barest beginning of a project such as this is to write a procedure which allows a shape to be moved about by pressing arrow keys, but also includes a key for stamping a shape in place. Eventually it becomes obvious that what is stamped might sometimes need to be UNstamped (or in the PLANTER version PLANTED and UNPLANTED) and a key can be added for this task as well.

Begin at the Beginning

This first procedure depends upon knowing the ASCII values for the arrow keys. Each key has its own ASCII number associated with it. (See LX, November 1987, "Teaching Tools - The Ins and Outs of ASCII" by Glen and Gina Bull for a fuller discussion of ASCII.) There is a quick way to get the information without need for special procedures or reference manuals. Do this:

Type SHOW ASCII READCHAR

Press Return (the cursor disappears)

Press the key whose number you need.

The ASCII value, a number, will appear in the command center.

Once you have the ASCII values you need, you can use CHAR and the number to stand for the key. CHAR 21, for example, is the right arrow key on an Apple. LogoWriter (and other versions of Logo) accept such designations and are able to act upon them. A procedure much like the many "Instant" Logo procedures can be written to access the keys you wish. I used the name PLAN for my procedure. It began like this:

```
TO PLAN :KEY
IF :KEY = CHAR 21 [SETH 90 FD 20]
IF :KEY = CHAR 8 [SETH 270 FD 20]
IF :KEY = CHAR 10 [SETH 180 FD 20]
IF :KEY = CHAR 11 [SETH 0 FD 20]
PLAN READCHAR
END
```

I used the headings as responses to the arrow keys, rather than right or left, since I wanted absolute directions for the four arrow keys. If you press a right arrow, the turtle

should move to the right ALWAYS. I used a move of twenty turtle steps, since that was the minimum distance the turtle must move to prevent its stamping on top of another shape. (Ultimately the idea is to move to a spot and "PLANT" something by pressing another key. This PLANT should not cover another PLANT.) The last line of the procedure, PLAN READCHAR, simply causes the program to run recursively.

I prefaced this with a starting procedure which looked like this:

```
TO PLANTER
PU
SETH 0
PLAN READCHAR
END
```

PLAN READCHAR waits for a key to be pressed, then moves to the PLAN procedure to act upon the key, if it is one on the list. If the key is not contained in the list, the last line of PLAN (PLAN READCHAR) is invoked, and the program waits for the user to press another key. I added keys to this program to PLANT, to UNPLANT, to STOP, plus a few others later on as I worked on the expansion to a data base for storing and retrieving information about the plants in the garden. Pressing Return (CHAR 32) was used to stop the program. Your own program can use a different key if you wish.

Going Further

Thus far the program doesn't appear to do a lot that you could not do with the turtle-move keys and a few commands. At this stage, it would be only marginally useful. What I had in mind was something more. The program should begin by asking what you want to do, perhaps just "WHAT DO YOU WANT TO PLANT?" followed by a list of what was available. The user response of the name of the plant is used by a new procedure, SETSHAPE, which sets the turtle to the desired shape.

Changing the Shapes

I wanted to write the program so that Louise could design shapes for her flowers and insert the shapes easily into the program. She might add other flowers after I handed her the finished program. I decided that it would be easy to show her how to use OUTPUT in a procedure. A new plant might then be added simply by adding a procedure like this:

```
TO PARROT.TULIP
OUTPUT 25
END
```

Louise could write this procedure herself and then design shape 25 to be a parrot tulip.

Initially, I decided to use OUTPUT for the shapes, so that one could type SETSH TREE and the turtle would switch to a tree shape. You can, of course, use this idea without using the PLAN program. This might be another way to approach the problem. The choice depends upon what you are interested in accomplishing with the project: are you working on a programming project or is your interest in creating and using a program which students can use, i.e., have you become a software developer?

Writing a SETSHAPE procedure is where things got a little beyond elementary Logo thinking. The first object accepted from the keyboard by READLISTCC is given the name SHAPE.

```
TO SETSHAPE
NAME FIRST READLISTCC "SHAPE
SETSH RUN PARSE :SHAPE
END
```

Now things get a bit more complex:. We want to set the shape to the shape name typed in the command center. SETSH :SHAPE would seem to be the solution, since SETSH PARROT.TULIP works correctly. However, we are now invoking a *procedure* for the input to SETSH. We need to make a list out of the procedure output (in this case from PARROT.TULIP.) It seems we are going in circles here, but the solution is fairly simple. This means we need to run the procedure in order for SETSH to use its output. However, if you try SETSH RUN PARROT.TULIP, you will still find a problem.

There is another primitive which helps us out here, PARSE. PARSE creates a list. If we use SETSH RUN PARSE PARROT.TULIP things work just fine. PARSE makes a list from the output from PARROT.TULIP, passes that list on to RUN, which needs a list for its input. RUN can then pass on its result (the number produced by PARROT.TULIP) to SETSH, which finally is able to respond, in a flash of a second, by changing to the appropriate shape.

The above procedure could have made this simpler by using SETSH RUN READLISTCC in SETSHAPE, but I knew that later on I would want the program to check for correct input before attempting to change the shape. By giving the shape a name, the program could store it as a value and then could check to be sure this shape was contained in the list of shapes.)

Finally, I added a procedure for changing plants, called CHANGEPLANT. Pressing C in the PLAN procedure brings up a question: "WHAT DO YOU WANT TO PLANT NOW?" followed by the list of available plants. CHANGEPLANT then uses the keyboard input to call SETSHAPE which, in turn, accepts the keyboard input to change the shape and resume the planting.

Getting Smarter

Later on the program got "smarter" and more user friendly. I added a procedure called PLANTS which outputs a list of the plants. This provided the text which gives the user the options from which to choose. I put this near the top of the flip side of the page and showed Louise how, when she had written a procedure to OUTPUT a new plant shape, she should also add that name to the PLANTS list so that her text would reflect her new list of plants each time.

Lastly I wrote an INFO procedure which allowed Louise to move directly from the planting page to the page about the plant. If she added a new plant, INFO would get and name a new page for her. Here she could add information about when she planted something, how many she planted, when they bloomed, where she got the bulbs or seeds, and so on. She might also stamp the shape on this page as an additional reminder. Each shape might have a "value" in terms of the number of plants it represented. This could also be stored on this page.

Still More Extensions

Once the skeletal version of the program was in place, Louise and I looked it over together. Then she said to me that she had been trying to program the shape of her garden and had felt that she wasn't comfortable with the process. "Is it possible to have a drawing tool?" she asked. I quickly added one on another page and showed her how to access it as a tool when she needed it. GETTOOLS "DRAWIT will do that provided DRAWIT is the name of the page on which the procedure is stored.

The drawing tool is simply another "Instant" program but one which might also be used as a tracing tool. The task this time is simply:

Design a program which responds to single keypresses with small FD, BK, RT, and LT distances. The procedure should also include keys for PU and PD in order to be truly useful.

This idea can be expanded upon as desired. In fact, giving a student the beginning of this and challenging her to customize it can be a good programming project even for a beginner! My third grade class last year created extensive variations on this idea, including color changes and invocations of other procedures. A fairly simple version was all that Louise needed to plot out her garden. A class working with such a tool might begin by considering ratios — ten turtle steps equal one foot, or some such measure — and design their drawing tool accordingly. Additionally, the tool might be used to reproduce a map from a transparency fastened to the screen. A transparency of a complex drawing might be used in the same way.

Other Directions

Can you see how this garden planning idea might link into many other ideas which involve creating a variety of shapes to be stamped upon the screen? Simple changes to the text may be all that is necessary to shift this from a garden-planning to a city-planning tool. There are many possible applications. How about a game of checkers in which a move unstamps and then restamps your checker in another spot? The principle is much the same. If you dream up any unusual variations, I'd love to hear about them.

Postscript

After I had worked on the gardening project I discovered, in a stack of old Apple magazines, a review of two gardening programs for the Apple. To my amazement, neither were as flexible or sophisticated as the LogoWriter program I had dreamed up for Louise. LogoWriter turns out to be a wonderful software tool. What one can do with it seems limited only by one's resourcefulness, programming skills, and one's imagination.

Note: If anyone would like a printout of the program and the exploration idea sheet, just send me a stamped, self-addressed envelope. If you'd like the program disk, please send a disk with mailer and return postage. Specify the Apple LogoWriter version you use (1.0, 1.1, or 2.0)

Eadie Adamson, The Allen-Stevenson School, 132 East 78th Street, New York, New York 10021

Logo Contest Produces Classroom Ideas

Terrapin, Inc. is pleased to announce the winners of its recent Logo Innovations Contest. Teachers from across the nation submitted their best classroom projects and teaching tips designed to integrate Logo into the classroom and make learning fun. Entries ranged from "bite-sized" ideas to full-fledged curriculum plans, from kindergarten games to university theses. Entries were judged on the overall presentation of the idea combined with its originality, universal appeal and the opportunity for individual or group exploration.

Terrapin wished to commend the following Grand Prize Winners, who were each awarded $500 worth of Terrapin Logo products:

Mr. James Harrell of Holmes Junior High School, Colorado Springs, CO developed a *Logo Weather Station*. He uses Logo to explore and collect information about local weather patterns. His entry uses Logo as a tool to explore a "real life" situation.

Mr. Gregory Williams of Boyertown Area Junior High School in Gilbertsville, PA submitted his entry, *Logo Miniature golf*. His program allows 4th to 9th grade students to play six increasingly more difficult holes of miniature golf using the Logo turtle as the golf ball. The entry represents a creative way to get students excited about learning to estimate degrees, distances and angles of reflection.

Ms. Frances Morse and Ms. Sara Beattie of the Edward Devotion School of Brookline, MA entered their project, *Turtles Explore Massachusetts*. They use Logo to help teach 5th grade students about local geography. This multi-disciplinary project can be adapted to teach about any state, province or country.

Runner Up and Honorable Mention projects include *Proportions, Vectors, Astronomy, Teepees, Logo Microworld, XY Shoot, Introduction to Logo*, and a Logo song and story.

In a continuing effort to spread good ideas for the classroom, Terrapin is developing a Logo Innovations Booklet containing the best curriculum ideas that were submitted. For additional information about the projects or to request information about the upcoming *Logo Innovations Booklet*, contact:

Terrapin, Inc.
376 Washington Street
Malden, MA 02148
(617) 322-480.

LogoLinx

Did Nietzsche Know Logo?

by Judi Harris

"A man has no ears for that to which experience has given him no access."

"Education has very little to do with explanation. It has to do with engagement, with falling in love with the material."

One of these statements was written in 1888. The other was recorded in 1983. The ideas that they express are remarkably similar, despite nearly a century of elapsed time between their public expression. Both were crafted by philosophers, although the tools that they used were strikingly different.

One was published by Papert; the other, by Nietzsche. Were it not for the difference in language, it might be difficult to identify the first as the older statement.

"Time Ripens All Things" (Cervantes)

Papert is fond of saying, "What's good for thinking is good for thinking." This is true across learner cultures, among pedagogical methods, and over time. Have you experienced an eerie sense of deja vu while perusing the pages of *Mindstorms*?

1a. "Errors benefit us because they lead us to study what happened, to understand what went wrong, and, through understanding, to fix it."
—*Mindstorms*, p. 114

1b. "Mistakes are their own instructors."
—Horace

2a. "The kind of mathematics foisted on children in schools is not meaningful, fun, or even very useful."
—*Mindstorms*, p. 50

2b. "Arithmetic is where the answer is right and everything is nice and you can look out the window and see the blue sky—or the answer is wrong and you have to start all over and try again to see how it comes out this time."
—Carl Sandburg

3a. "By working with small parts...bugs can be confined and more easily trapped, figured out."
—*Mindstorms*, p. 102

3b. "Nothing is particularly hard if you divide it into small jobs."
—Henry Ford

4a. "....the gulf must be bridged between the technical-scientific and humanistic cultures. And I think that the key to constructing this bridge will be learning to recast powerful ideas in computational form, ideas that are as important to the poet as to the engineer."
—*Mindstorms*, p. 183

4b. "A mathematician, like a painter or poet, is a maker of patterns."
—G.H. Hardy

5a. "The LOGO teacher will answer questions, provide help if asked, and sometimes sit down next to a student and say: "Let me show you something." What is shown is not dictated by a set syllabus."
—*Mindstorms*, p. 179

5b. "[People] must be taught as if you taught them not, And things unknown proposed as things forgot."
—Alexander Pope

It seems that many of the most powerful ideas expressed by educational philosophers are written with indelible ink in the pages of time. Perhaps that is one testament to the truth of their messages.

Eloquent Reminders

During a recent visit to a central Virginia kindergarten, I noticed this quote, posted high on a wall, just above the students' pictograph of favorite animals.

"When you are dealing with a child, keep all your wits about you, and sit on the floor."
—Austin O'Malley

My initial reaction was one of confusion. Certainly, this master teacher realized that her students were not able to decode, much less decipher the delightful idea posted near the ceiling! And then, the poster's position revealed the flaw in my thinking. These words were a reminder to the ADULTS in this classroom culture.

Are you a "quote collector?" I am, and I'd like to share some of my favorites with you this month. They are selected

for their relevance to what we generally call "Logo philoso-phy." But, as their author listings will indicate, they origi-nate in the common base of human experience from which Logo itself sprang, along with many other calls for reform in education throughout history.

On Learning

"I hear and I forget.
I see and I remember.
I do and I understand."
—Chinese proverb

"Let early education be a sort of amusement; you will then be better able to find out the natural bent."
—Plato

"What is learned....depends far less on what is taught than on what one actually experiences in the place."
—Edgar Friedenberg

"You come to know a thing by being inside it."
—Edmund Carpenter

"Wonder rather than doubt is the root of knowl-edge."
—Abraham Heschel

"To learn is a natural pleasure, not confined to philosophers, but common to all [people]."
—Aristotle

"The creative mind plays with the objects it loves."
—Carl Jung

On Problem-Solving

"There is always more chance of hitting upon something valuable when you aren't too sure what you want to hit upon."
—Alfred North Whitehead

"The great difficulty in education is to get expe-rience out of idea."
—George Santayana

"Failure is, in a sense, the highway to success, inasmuch as every discovery of what is false leads us to seek earnestly after what is true."
—John Keats

"The best ideas are common property."
—Seneca

"(A mistake is) evidence that somebody has tried to accomplish something."
—John Babcock

"Give me a good fruitful error any time, full of seeds, bursting with its own corrections. You can keep your sterile truth for yourself."
—Vilfredo Pareto

"Every solution of a problem is a new problem."
--Goethe

"Problems are only opportunities in work clothes."
—Henry J. Kaiser

On Education

"There is a grave defect in the school where the playground suggests HAPPY and the classroom DISAGREEABLE thoughts."
—John Spalding

"If a man does not keep pace with his companions, perhaps it is because he hears a different drum-mer. Let him step to the music which he hears, however measured or far away."
—Thoreau

"Most students treat knowledge as a liquid to be swallowed rather than as a solid to be chewed, and then wonder why it provides so little nour-ishment."
—Sydney Harris

"What is more wonderful than the delight which the mind feels when it KNOWS? This delight is not for anything beyond the knowing, but is in the act of knowing. It is the satisfaction of a primary instinct."
—Mark Rutherford

"School is not preparation for life...school IS life."

—John Dewey

"Children have to be educated, but they have also to be left to educate themselves."

—Ernest Dimnet

"An education which does not cultivate the will is an education that depraves the mind."

—Anatole France

"I have learned much from my teachers, and from my colleagues more than from my teachers, and from my students more than from all."

—Haggadah

On Teachers and Teaching

"It is the supreme art of the teacher to awaken joy in creative expression and knowledge."

—Albert Einstein

"Our chief want in life is somebody who will make us do what we can."

—Ralph Waldo Emerson

"The students are alive, and the purpose of education is to stimulate and guide their self-development. It follows as a corollary from this premise, that the teachers should also be alive with living thoughts."

—Alfred North Whitehead

The West Coast Logo and Telecommunications Conference lives!

Date: February 3-4, 1989
Place: Los Angeles Hilton Hotel

"The object of teaching a child is to enable him to get along without his teacher."

—Elbert Hubbard

"To teach is to learn twice."

—Joseph Joubert

"No man can reveal to you aught that which already lies half asleep in the dawning of your knowledge."

—Kahlil Gibran

A Final Quote

Mark Twain once observed,

"What a good thing Adam had—when he said a good thing he knew nobody had said it before."

Education is too often a process of reinventing wheels. Viewed only as an application of computer technology, Logo is newborn and time-bound. Viewed in historical and philosophical perspective, Logo is a natural outgrowth of progressive educational thought, set in a particular time window of technological advance. Let us recognize the foundations of many of our most powerful pedagogies, and build upon them.

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Logo in China

Key Educators Learn Logo at The People's Education Press, in Beijing, China

by Molly Watt

More than a year has passed since we arrived in Beijing, China as part of a team of six American educators bolstered by a Pace University graduate student who is a native of Xin Jiang Provence. Our baggage included just the standard equipment for our work: a turtle puppet, a robot, several versions of the Logo language, a few hundred blank disks, copies of *The Computing Teacher* and *The Logo Exchange*, 125 pieces of examplary educational software, many books, a few videos, several tape recorders, half a dozen cameras, two lap-top computers, two Macintosh Computers and ten Apple IIe computers plus a couple of quick guides to the Chinese language. Most of the materials were gifts from the publishers and manufacturers to our hosts, and the team members contributed their professional time.
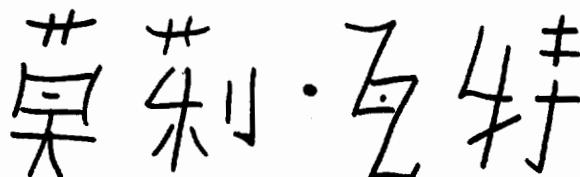
Molly Watt in Chinese Characters

We were invited by Professor Wu Yongxing, a gracious and articulate scholar, who is the Director of the Curriculum and Teaching Materials Research Institute (CTMRI), part of the People's Education Press (P.E.P.). The press is a significant publishing house having produced twenty billion books during the past thirty years. It plays a major role for text book publishing and curriculum development for the approximately 183 million K-12 students in the People's Republic of China.

Even before the workshop began our hosts at The People's Education Press made a strong commitment to the continuation of our work. They planned to establish and staff an ongoing center for educational computing, which meant building an addition to their existing facilities. They also planned to incorporate microcomputers into the work of publishing curriculum and text materials. Tao Zhenzong, a member of the computer research department, was identified as the first director of the new center. His preparation for and participation in providing technical support for the workshop were critical to its ultimate success. Tao has a background in computer science and is fluent in written English. He translated many teaching materials and articles as well as translating *Learning with Apple Logo* by Daniel H. Watt (1983) which was published by the People's Education Press before the workshop started (Watt, 1986).

The purpose of the workshop was to demonstrate many educational uses of computers during a four week workshop featuring experiential learning. The workshop met daily Monday through Saturday from 8:30 A.M. to 4:30 P.M. Our "students" were forty key educators selected to attend because they held leadership positions in teaching, curriculum development or publishing of educational materials.

Our goals for the worshop were rather ambitious:
1. Developing a philosophy and structures to guide the use of computers with children
2. Teaching structured Logo
3. Teaching (by example) how to teach Logo
4. Demonstrating programs in a variety of educational fields
5. Leaving students with the confidence to use computers in their own teaching
6. Developing (through discussion and demonstration) criteria to evaluate software programs for use in schools in the People's Republic of China
7. Promoting the "creative use" of programs with children
8. Introducing productivity tools and their classroom applications
9. Introducing desk-top publishing

(Rasmussen, Sept.,1986)
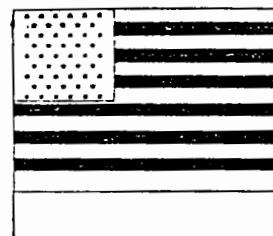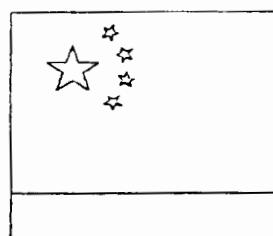
These flags were part of a collaborative programming project symbolizing our friendship

"Logo in China-- CONTINUED

The workshop schedule was divided. Mornings were devoted to Logo and afternoons to other elements of educational computing. This article will focus on the Logo half.

Tao Zhen, Director of the P. E. P Computer Center enjoys a moment with his daughter

To understand why learning Logo is potentially important for educators in Beijing, it may be useful to identify just how it may fit with official policies in China at this time in history. Like education reform movements in the United States, the People's Republic of China has taken as an official objective of educational reform to "constantly pursue new knowledge and cultivate the scientific spirit of seeking truth from facts, thinking independently and daring to make innovations. This presents a tremendous and arduous task in the development of China's education and reform of the education structure." (The CPC Central Committee, 1985) This is a particularly complex task as the education of many of our workshop participants was interrupted during the Cultural Revolution (1966-1976) "when the need for knowledge was neglected and education was abolished". (The CPC Central Committee, 1985)

We used Logo in Beijing as we often do in the United States: to involve educators in mathematical problem-solving experiences in an active learning context. In both the U.S.A. and China teachers need direct experiences with this type of learning and models for making these approaches part of their own practice. We used Logo as a language for learning and for learning about learning, as well as an opportunity to offer teaching challenges, create coaching situations and collaborative programming projects. We took specific examples from the workshop itself, making our own teaching strategies part of the curriculum.

Dan Yonyxu, staff member of the P. E. P. computer center participates in Logo and Computers in Education workshop.

Logo is perhaps particularly well suited as a medium for education in China. Its use of the turtle as a tool to think with connects positively with the Chinese culture in which the turtle is a symbol of longevity. The Logo programming style of naming each small Logo procedure specifically is perhaps similar to the way each particular corner and curve of the landscape of China has a particular name. Logo programming projects in China must still be written using the alphanumeric symbols on the keyboards rather than the Chinese ideographic characters. However the procedure names can be written in pinyin, an alphabetic script adopted by the Chinese and used in some schools to teach reading pronunciation to young children. Chinese characters can be drawn with the turtle on the monitor. And our students enjoyed being able to create examples of structured programming by making graphic representations of familiar sights in Beijing, thus linking their work to their specific cultural context.

This team produced a Logo program to draw the Chinese characters for China on their screen.

Logo in China-- CONTINUED

We published the Logo programming projects in a book of teaching examples for each participant to take away to use in their own teaching and curriculum work. Because they were to be published, the projects had a purpose for the participants beyond just learning to use Logo. Therefore programs needed to be clearly written to be understandable and elegant examples for anticipated student audiences. Our workshop participants took the time to revise and polish their projects. Part of this work included participating in a process of conferencing, criticism and coaching. The finished book remains an important exhibition for each of us representing our collective achievement. (Logo and Computers in Education Workshop, 1986)

Since the initial workshop the People's Education Press has finished building a center for educational computing. Tao Zhenzong and his family have moved into an apartment adjacent to it. The microcomputers have been integrated into the on-going work of curriculum development and publishing at the press producing many texts. Another workshop participant, Dai Yongxa, has been added to the center's staff. Future plans and directions are still being formulated. Some of our colleagues from P.E.P. have found ways to augment their own knowledge by becoming visiting scholars or pursuing degrees in the United States and England. And Prof. Wu would like to find internships for P.E.P. staff in the United States in educational software, publishing and video companies. He thinks future needs of workshop participants include advanced work in Logo programming and software evaluation. He wants to know more about long distance learning opportunities to help educate teachers to use math manipulatives and to learn problem-solving strategies. This sounds familiar to our own concerns about educational reform in the United States. Except, of course, on a much larger scale.

People's Education Press editor, Xu Yan, told me that when our team first came to China, they were happy because we were bringing them technology. Later they realized that we were teaching them to use the technology. Then they noticed that we were teaching them to teach. And then she saw that we were learning how to relate to each other. Today I sit in my home in New Hampshire missing my friends and colleagues in Beijing and practicing drawing my name in characters. Perhaps someone in Beijing is drawing her name with the Logo turtle! I hope to have an opportunity in the near future to pack my bags again for Beijing or host a colleague here.

Members of the team from the United States were: Arthur Powell, Jr.; Donald Rasmussen, Steven Rasmussen, Flora Teres Russ, Daniel H. Watt, Molly Watt and Zhang Wei.
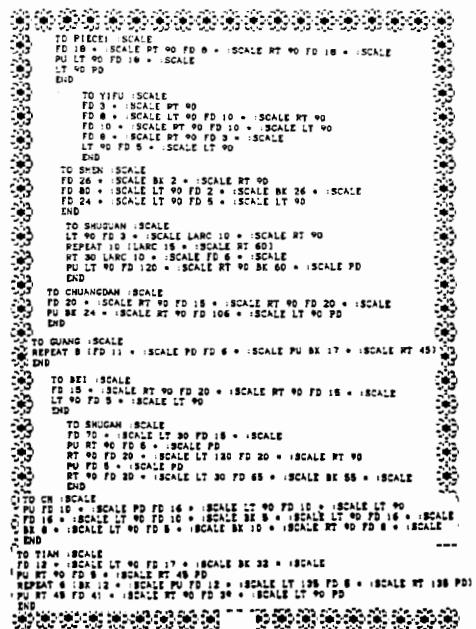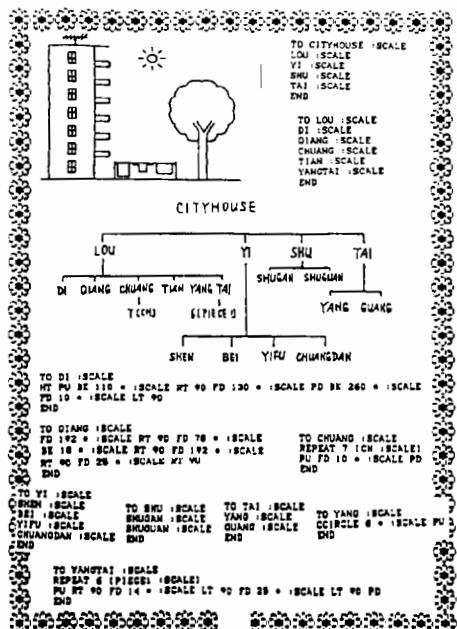
A Logo programming project illustrating apartment housing at P. E. P. and the use of pinyin to name subprocedures

If you would like to know more, contact Prof Wu Yongxing or Tao Zhenzong, People's Education Press, 55 Sha Tan Hou Street, Beijing, China, or write me: Molly Watt, Center for Learning Technology, Education Development Center, 55 Chapel St., Newton, Mass 02160

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MathWorlds

edited by A. J. (Sandy) Dawson

The first time I talked with Harold Brochmann was the day he demanded to be admitted into graduate studies one hour prior to the first class. Needless to say, he was not admitted to the program, not then anyway. Subsequent to that experience, I seemed to hear more of Harold weekly.

In the early days of Logo Harold made C-64 machines do things that even Commodore reps said were impossible. Harold shepparded a classroom of 64s around his school district, introducing teachers and students alike, to the fun of computers and the joys of Logo.

My next interaction with Harold occurred when I was making the *Beyond Turtle Graphics* film with my colleague David Bell. We taped Harold for over an hour while he talked about Logo, his experiences with children learning Logo, and his inventiveness in using Logo as a tool to demonstrate some rather sophisticated mathematics for the junior and senior secondary school.

And then last summer Harold enrolled in the graduate program at Simon Fraser University, and I had the pleasure and challenge of having Harold in my Logo and mathematics graduate course. Among other things, Harold was playing with randomness and fractals using Logo and still working on his C-64 machine. Over the summer we helped 'ween' Harold away from that machine by introducing him to LCSI Logo for the Mac. As you can see below, Harold did not waste any time in exploring these new toys.

A Mandelbrot Primer

by Harold Brochmann

Scientific American magazine has a monthly feature called "Computer Recreations". The November 1987 issue described how one might get a computer to chart the Mandelbrot set. Although I had heard this term before, it never had any meaning for me. After reading the opening paragraph I decided to pursue the matter further:

The Mandelbrot set... has emerged as the newest and brightest star on the firmament of popular mathematics. It is both beautiful and profound... (its) patterns encode the various forms of chaos and order."

Irresistible!

The article made it all look so simple, but it took many hours of pondering to translate the explanation into a debugged computer program which replicates the accompanying illustrations. My umpteenth version ran for 12 hours to produce this picture on the Macintosh screen:
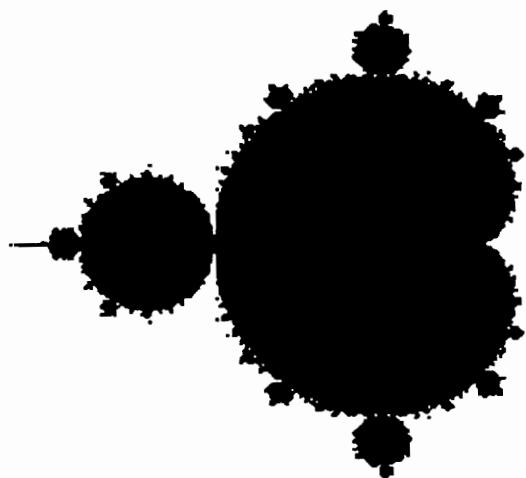
The Mandelbrot Set is a region near the origin on the coordinate plane. When the complex numbers associated with points inside the region are subjected to certain iterative operations (described below) they behave differently than those that lie outside it.

The image was created by a computer program which considers in turn, each of the approximately 65 000 points that have X coordinates in the range -1.5 < x < 0.75 and Y coordinates in the range -1.45 < y < 1.45 in steps of 0.01. If the point being considered is a member of the Mandelbrot set the corresponding computer screen pixel is turned off. If the point is not a member the pixel is left on.

My program was written in LCSI Macintosh Logo, and I include a listing in case other readers are interested. The main procedure calls PLOT, specifying the range:

```
TO MANDEL
PLOT [-1.5 0.75] [-1.45 1.45]
END
```

Procedure PLOT calls PLOT.V, passing along the lowest X value and the list containing the range of Y values. The recursive call to PLOT incrementes the x-value until the upper limit has been reached.

```
TO PLOT :X :Y
IF ( FIRST :X ) > LAST :X [STOP]
PLOT.V FIRST :X :Y
PLOT :X + 0.01 :Y
END
```

PLOT.V is also recursive, stepping through the range of Y values, each time calling INMANDEL?, passing along the value zero and the coordinates of the point under consideration. If INMANDEL? returns TRUE, the appropriate Macintosh screen pixel is turned off, otherwise it is not.

```
TO PLOT.V :X :Y
IF ( FIRST :Y ) > LAST :Y [STOP]
IF INMANDEL? 0 :X FIRST :Y
  [ DOT SENTENCE :X * 100
    (FIRST :Y) * 100 ]
PLOT.V :X :Y + 0.01
END
```

Procedure INMANDEL? determines whether or not a point is within the Mandelbrot set. Each pair of coordinates specifies a complex number. A complex number has both a real and an imaginary part. In $a + bi$, a and b are real and $i = \sqrt{(-1)}$. So

$$(a + bi)^2 = a^2 + 2abi + b^2i^2 = (a^2 - b^2) + (2ab)i$$

The "magnitude" of the number is defined as distance to the origin, i.e., magnitude of $a + bi = \sqrt{(a^2 + b^2)}$.

If the real number 2 is repeatedly squared, its magnitude quickly increases: 2, 4, 16, 256... Subjecting 0.2 to the same treatment leads to decreasing magnitudes: 0.2, 0.04, 0.0016, 0.00000256... The real number 1 is a "boundary" number whose magnitude remains static under these conditions.

The criterion by which a point on the coordinate plane is judged to be inside or outside the Mandelbrot region is whether many "squarings" (I used 100) of the corresponding complex number make its magnitude increase (in this case beyond the value of 2), as opposed to remain small. The input :COUNT keeps track of the number of times the complex number has been squared. This input is initialized to zero by PLOT.V each time INMANDEL? is called.

MathWorlds -- CONTINUED

```
TO INMANDEL? :COUNT :X :Y
IF :COUNT > 100 OUTPUT "TRUE
MAKE "A SQR :X - (SQR :Y)
MAKE "B 2 * :X * :Y
IF SQRT ((SQR :A) + SQR :B) > 2
    [OUTPUT "FALSE]
INMANDEL? :COUNT + 1 :A :B
END
```

By making adjustments to this program it is possible to "zoom" in on selected portions of the Mandelbrot set. The next illustration show a portion of the "main pod" at 10X magnification.

The incredible unstable nature of the boundary is revealed. We seem to be peering through a computer microscope at bursting pollen pods of some wonderful mathematical fern.

Logo, being interpreted, can be an annoyingly slow language to work with. The last illustration took several days to complete.

My next project is to try to come to grips with what all this has to do with that other "bright star on the firmanent of popular mathematics": Fractals!

Harold Brochmann is a teacher in North Vancouver, British Columbia, Canada and a graduate student in the Computers in Education program at Simon Fraser University.

Teaching Tools

"Logo Reflections"

by Glen Bull

I have written a column for the *Logo Exchange* each month during the school year for the last six years. The total is now more than fifty columns. This seems a good time to reflect on the history of the *Logo Exchange*, and the state of Logo.

Eight years ago a colleague handed me a book and said, "You ought to read this." At the time I did not realize the effect that *Mindstorms* would have on my life. The ideas about "children, computers, and powerful ideas" were intriguing; I requested the working papers on Logo published by the MIT Artificial Intelligence Laboratory.

Soon thereafter Steve Tipps and I attended a Logo workshop given by Dan Watt. The computers arrived at the workshop moments before the workshop began. Although I did not recognize it, this was a pattern which was to occur again and again. The workshop was exciting, and we talked nonstop during the three-hour drive back home from the workshop. One result of that enthusiasm was a decision to add Logo to our courses in Instructional Computing at the University of Virginia. Armed with a weekend of training by Dan Watt and a copy of *Mindstorms*, we were ready to begin exploring Logo.

At that time the TI 99/4 microcomputer was the only commercial microcomputer on which Logo was available. Texas Instruments agreed to provide a half-dozen microcomputers with Logo so that we could include Logo in our course on educational computing. Shortly after the course was announced, I received a call from a graduate student in the Physics Department. He was interested in Logo, and wanted to take the course. That graduate student, of course, was Tom Lough.

The Texas Instruments computers arrived the morning that the course was to begin. This was a pattern which was to occur again and again. While Steve and I were uncrating the computers, Tom appeared and helped us unpack. The Texas Instruments computers were excellent, and had features such as sprites which are not available on computers such as the IBM and Macintosh today. Programs were stored on cassette tape recorders. This system seemed to work well unless it rained. The other casualty occurred when Christmas carols were recorded on top of a final project stored on an unlabeled cassette.

After the course, Tom approached Steve and me, and told us that he was going to found a Logo newsletter. The name of the newsletter would be the *National Logo Exchange (NLX)*. Tom asked if Steve and I would each write a column for the newsletter. We innocently agreed. Steve ever after claimed that he only agreed to do the column because he never believed that Tom would actually produce the newsletter. The first newsletter was printed on a dot matrix printer in Tom Lough's basement. Later Tom acquired a letter-quality printer, and later still an Apple Laser-Writer. When the magazine outgrew Tom's basement, Meckler publishing took over as publisher. A year later the International Council for Computers in Education (ICCE) assumed responsibility for the publication. As the international scope of Logo became apparent, Dennis Harper assumed responsibility for an international section, and the name was changed from the *National Logo Exchange* to the *Logo Exchange*.

During this time, this column had several names. The original column title, influenced by Papert's book, was "Microworlds." Later I decided to explore the text handling facilities of Logo, and changed the name of the column to "Listful Thinking." Partly for fun and partly to counter some of the incorrect stereotypes about Logo, I wrote several columns without any graphics commands at all in them during this period. During this time Paula Cochran also joined me as a coauthor of the column.

Paula and I were especially interested in applications of Logo to special populations, and were very much influenced by the work of Sylvia Weir. As a result of this interest, we began conducting workshops on these applications. Many times the computers would arrive just before the workshop was to begin. This was a pattern which was to occur again and again.

My wife, Gina, had observed my intoxication with educational computing with bemusement. Her undergraduate degree was in History of Art, and at that time she worked in the University of Virginia Fine Arts library. Gina's interests lay in the creative and artistic areas rather than in computing. However, as she observed the combination of kids, computing, and Logo, a curious thing began to happen. She began to see the creative side of computing, and found that she enjoyed it.

As a result, Gina decided to return to school and obtain a Master's degree in Computer Science. With a Bachelor's degree in History of Art, this seemed a natural career direction. We approached the matter quite rationally. We tallied

our income, adjusted for the added expense of tuition and books, and the loss of one salary in a formerly two-income family. As a result of these calculations, it was quite clear that we could not afford for Gina to return to school — so we did it anyway. This conclusively demonstrated the advantages of spreadsheets. (At the time we used Visi-Calc, but I am sure the results would have been the same if we had used Lotus 1-2-3.)

It is too soon to calculate the effect that Logo has had upon the educational process. However, it certainly affected us in a deep and personal way. Gina received her M.S. in Computer Science, and is now a programmer analyst in the Computer Science Department. If I need any information on Unix, I have an in-house consultant.

Throughout this time, I wrote a column for Tom (and later Sharon when she assumed the editorship) each month for nine months a year. This has resulted (to date) in a total of 53 columns. The one exception occurred in February five years ago when our son Stephen was born. For that one month, Tom excused me from the column. Stephen has grown up with Logo.

After the "Microworlds" and "Listful Thinking" columns I gradually came to the conclusion that one of the most interesting uses of Logo is as a teaching tool. There is a considerable difference between teaching about Logo and using Logo to teach. It is the latter use — as a teaching tool — that I now find interesting. Hence the current title of the column, "Teaching Tools."

When Paula completed her doctoral work, and joined the faculty of a Missouri university, Gina began writing the column with me. People who are not familiar with educational computing or Logo sometimes ask if we ever run out of ideas. If the truth be known, for every column written, there are two more which could have been developed. Logo in proximity to children seems to generate ideas.

Logo has matured as a language from the time that Version 1.0 of Terrapin Logo and the first version of Apple Logo by Logo Computer Systems, Inc (LCSI) were introduced. In fact, when the school year begins again next fall Gina and I hope to discuss development of Logo drivers for videodiscs and CD-ROM's.

Despite these advances, Logo as an idea has had a greater impact than Logo as a language. It certainly has provided a counterpoint or anchor at the opposite end of the continuum from computer assisted instruction (CAI). One of the chief effects of the Macintosh computer is that it has

provided an alternative vision to the idea of the "A>" command prompt. (Many of the ideas embodied in the Macintosh were first conceived at other centers such as the Xerox Palo Alto Research Center, but it was the Macintosh which popularized these ideas.) Computer interfaces such as Microsoft Windows and IBM's OS/2 reflect this influence, benefitting all computer users. In the same way, Logo has influenced visions of educational computing, even in classrooms in which it is not directly used.

Considered solely as a computer language, Logo still has some shortcomings despite major enhancements over the years. (All computer languages have shortcomings of some kind — this provides employment for computer scientists and researchers.) One major factor which has limited use of Logo to the educational arena is lack of a compiled version. As a result, programmers who wish to distribute Logo programs must give away the source code — and provide a copy of the correct dialect of Logo as well. This has been a major barrier to distribution of Logo ideas and programs. It could be argued (correctly) that Logo was designed only as an educational language, and not as a vehicle for development of major programs. However, the existence of multiple dialects of Logo has also been a major impediment to exchange of ideas and Logo programs among children as well. Since the only alternative to the existing situation is abolishment of the free enterprise system, this would seem to be a necessary situation.

Interestingly enough, Apple faces some of the same problems with its new programming environment, Hypercard. Hypercard has many Logo-like qualities. Hypercard scripts can not be compiled. However, Apple has decided to solve the distribution problem by giving away a copy of Hypercard with each Macintosh sold. This will ensure that a Hypercard script (or "stack" as these programs are called in Hypercard parlance) will run on almost any Macintosh. As a result, literally thousands of Hypercard scripts are being developed and placed in the public domain by Hypercard users. This is rapidly leading to the development of a Hypercard culture which shares a common interest in Hypercard activities. Hypercard users frequently use a public domain Hypercard stack as a starting point for ideas of their own.

As a result of its confinement (for the most part) to educational use, there has not been a strong impetus for refinement and growth of Logo on machines other than the Apple II computer. Both LCSI and Terrapin have continued to improve and refine their respective versions of Logo for the Apple. However, IBM Logo has not been updated since the original version was introduced several years ago. Other

Teaching Tools -- CONTINUED

versions of Logo for the IBM, such as Digital Research Logo ("Dr. Logo") are no longer available. Sales of Logo for the Macintosh were so limited that Microsoft returned the license to LCSI. Employment of Logo for non-educational applications could have generated stronger interest in its use on machines other than the Apple II. However, lack of an effective way to distribute Logo software (given absence of compiled versions) baffled developers.

An educational market has made it necessary to develop versions of Logo for machines in the marketplace — 64 and 128 kilobyte Apples. As a result, many of the more sophisticated and desirable features which might have been possible on machines with more memory and faster processors have not been realistic for the educational market. As IBMs and Macintoshes with megabytes of memory and multitasking operating systems trickle down to schools, this may be reflected in the power and friendliness of future versions of Logo.

To place all this in perspective, it is necessary to remember that Logo was under development for more than a decade before it was widely available. Logo was under development long before microcomputers existed. The development efforts of the 1970's paid off in the 1980's. Even now development efforts could be under way which will not bear fruit until the 1990's. For example, Andy diSessa and others are working on a possible successor to Logo called Boxer. As this is written, Boxer only runs on LISP machines and expensive Sun workstations. However, trials in the public schools are scheduled for this spring.

We have acquired a Sun workstation in excited anticipation of playing with Boxer. We are scheduled to receive a copy of Boxer "real soon now." It is quite possible that six years hence the seemingly powerful Sun workstation, with its 4 to 16 megabytes of memory, will seem as primitive as the original Texas Instruments 99/4 microcomputer with 64 kilobytes of memory does now. If that is the case, at that time we may write another retrospective column (possibly for what by that time may be the *Journal of Learner-Based Tools*) with the title "From Logo to _____."

In the meantime, we have scheduled a graduate seminar on Boxer. I suspect that Boxer will arrive moments before the class starts. This is a pattern which I have begun to recognize.

Glen Bull, Curry School of Education, Ruffner Hall, University of Virginia, Charlottesville, VA 22903; CompuServe: 72477,1637

Call for Papers
Second European
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If you wish to participate, contact:

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Department of Education — EDIF
EUROLOGO '89
H. Dunantlaan 1
B9000 GENT BELGIUM

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User Group Conference

College of Saint Paul and Saint Mary, Cheltenham

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This conference is intended for primary and secondary teachers, advisory teachers, teacher trainers, researchers in education and anyone else interested in the use of microcomputers in schools, in particular in the Logo programming language.

For bookings or futher details write:

The British Logo User Group,
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WALSALL, West Midlands
WS5 3RW

Building on Previous Work

*by Dave Moursund and
Sharon Burrowes Yoder*

Central to the development of problem solving skills is the idea of building on the previous work of yourself and others.

Central to the Logo culture is the idea of immersing students in a "Logo environment."

Sharing in the Logo Environment

Building on previous work of yourself is a form of sharing with yourself. Building on previous work of others is a form of others sharing with you. Publishing is a way to share your work with others. All three of these ideas are fundamental to human intellectual endeavor.

Sharing of information is a central theme in the Logo environment. Youngsters in a classroom that captures the Logo philosophy are encouraged to explore and to share discoveries, questions, and program bugs. In this process, children routinely build on the work of others. For an discussion of the Logo environment, see "Creating a Logo Environment" by Tim Riordan in the November 1982 issue of *The Computing Teacher*.

We have all heard stories about and/or had first hand experiences with children learning Logo ideas from each other. In a classroom, school, or computer lab one student discovers a neat idea. Perhaps it's how to draw a circle or how to create animation. In short order circles or animation proliferate throughout the Logo community. Children learning from each other is a powerful idea.

The Three Rs—Building on Previous Work of Others

But even more important than children learning from each other is how the human race makes intellectual progress by building on the work of previous great thinkers. For example, consider the reading, writing, and arithmetic that you routinely use. Skills in these areas are indispensable to problem solving in many areas. The three Rs represent many years of developmental work by a large number of brilliant scholars.

Building on previous work of oneself and others is a central theme in Logo. There are three obvious components that parallel the three Rs discussion. First, the Logo language, and the computer systems it runs on, represent many years of work by a large number of people. Second, learning

Logo is a cumulative process in which one gradually learns the Logo language. Third, Logo was specifically designed to be an easily extensible language. With Logo, you and your students can easily create procedures that can serve as building blocks for future work. It is not necessary to "reinvent the wheel" — one merely has to load procedures written and saved earlier. Thus, Logo provides an excellent environment for students to explicitly explore how they can build on their own previous work.

Thinking about Thinking and Learning

Research on problem solving strongly supports the idea of encouraging students to think about their own thinking and learning. This is an important type of sharing with oneself. The Logo learning environment provides many unique opportunities to help a child learn to think about thinking and learning. In this environment a student can be encouraged to talk and think about learning that has occurred, learning that is occurring, and learning that will occur. Often the relationships among these three are quite complex.

For example, consider a very young child who has seen someone, perhaps another child, use a pencil sharpener. The young child sticks a pencil into a pencil sharpener and awkwardly turns the handle. Even before first attempting to use a pencil sharpener, the child has a mental model of what the device might accomplish. Upon actually using a pencil sharpener, the child's mental image will probably be modified.

In learning to use and in using a pencil sharpener, the child will form a mental image of what a pencil sharpener is, how it works, and how it relates to his/her previous knowledge. But this self-discovered set of attachments to previous knowledge may be quite inaccurate and limiting. Perhaps the child has seen a stick chewed by a beaver. The very young child may imagine small beavers live inside the pencil sharpener, and that turning the handle encourages the beavers to start chewing! This incorrect mental model of the internal functioning of pencil sharpeners may severly restrict some future learning—perhaps in an entirely unrelated area.

While this particular example may seem far fetched, the point should be clear. Any learning depends on previous learning. Discovery-based learning is a powerful idea. But what if students make terribly incorrect discoveries? When, if ever, is it appropriate for a teacher to intervene in a

Building on Previous Work -- CONTINUED

discovery-based learning situation to help ensure greater correctness of what the student is discovering?

What mental images and attachments do you think might be useful to the child learning about a pencil sharpener? How might you help the child to develop a mental picture of how the handle is attached to a set of rotating cutting devices that shave off pieces of wood from the pencil? What else do you want the child to learn about the workings of a pencil sharpener? Are there similar devices that perform other tasks, so that you can work on transfer of learning? Why does a pencil sharpener have a relatively long handle with a knob on it? Will a pencil sharpener still work without the knob or without the long handle? Why doesn't an electric pencil sharpener have a handle?

Most likely as you mentally responded to the questions of the previous paragraph you also thought about ways to work with a child. Perhaps you thought about talking with the child, asking the child to tell you how a pencil sharpener works. Perhaps you thought about providing the child with a pencil sharpener with a broken handle, or with an electric pencil sharpener. Once you have the idea that the child is building mental models, you can work to understand what models are being built, and you can work to ensure that the models will be supportive of future learning.

Applications to the Logo Learning Environment

With the pencil sharpener example in mind, imagine a young child first approaching a computer with Logo software. What mental models do you want the child to form? What can you do to help the child relate this new device to previous knowledge and experiences? What mental models will be most useful for learning a lot about problem solving in a Logo computer environment and transferring that knowledge to other environments?

In some instances learning Logo might also be a child's first exposure to computers. In this instance, it is important that an appropriate mental model of the computer be developed. How does the computer monitor relate to the undoubtedly familiar televison set. Where has the child seen keyboards before? What images of computers has the child obtained from television, movies, and stories. You want to help children develop a model that will not get in the way of future learning. This may involve ongoing discussions as the children work with the computer to develop accurate mental models.

In most cases, children will have encountered computers either at home or at school before entering your Logo class. How is the Logo software different from other software that they have used? Is it similar to or different from games that they have played? How does it resemble or not resemble CAI that they have used? Have they seen other problem solving software? Is any of this previous experience like Logo?

What characteristics of Logo are important here? Certainly it would be well to focus on the learner control as it differs from much other software used in schools. When using Logo, the student rather than the computer controls what happens. Another characteristic is the extensibility of Logo. Unlike most other computer software, Logo can be used to build personal tools that can be valuable later.

Building on Previous Work in Logo

Earlier we noted that students in a Logo environment are encouraged to share ideas — that is an essential part of the Logo philosophy. But what of teaching students explicitly to build on the work of themselves and others?

In order for students to build on their own earlier work, they have to write and save their work. What mental images do you think children form as you help them learn to save their work and then use it at a later date? Have they ever encountered an idea exactly like this before? It's not quite the same as saving some of your candy to eat later. It's not quite the same as saving a story you have written, so you can read it again or add to it later. It is somewhat like having learned something, such as how to count or add. The next day you can still count and add, and can use these capabilities to solve other problems.

Building on previous work of oneself and others is undoubtedly the single most important idea in problem solving. Your students have been doing this all of their lives. But most likely this has never been made explicit to them. Logo provides a unique environment in which a child can create a tool and later make use of the tool. Also, a child can share their ideas with others, and still have it for him/her self. Every Logo procedure that a child creates and saves can be viewed as a tool—a building block for future use.

What Logo tools does a child want or need? Which tools should be provided in a formal toolkit, and which

Building on Previous Work -- CONTINUED

should be the child's own creations? These are hard questions, and the answer will surely vary from child to child and from classroom to classroom. But each of your students can both learn to create tools for his/her own personal toolkit, and learn to use tools developed by others. Each of your students can develop an explicit understanding of having a toolkit and making use of its contents. These are powerful ideas.

Transfer

Building on one's previous work and learning is at the core of transfer. As students encounter a Logo environment they encounter a number of ideas that are absolutely essential in learning and in problem solving. The problem solving literature says that these ideas should be made explicit, and that they should be illustrated in many different ways. That is, substantial thought and effort should be put into helping transfer to occur.

Here are some questions that you can raise and discuss with your students. Many suggest ideas that students can explore on their own, talk about, and write about.

1. Suppose you get on an elevator and want to go to the 4th floor. You push the button with a 4 on it. Immediately after this another person pushes the 5 button. How does the elevator know which floor to go to first? Does it make a difference if you are starting from the 8th floor?

2. How do you know that superwoman and superman can fly? Who else do you know that can fly? Do you know any "real" people that can fly? (The answer to the latter question is yes. But the flying process makes use of an airplane or perhaps a hang glider.)

3. Today you know how to add up a set of numbers, such as $8 + 3 + 5 + 9$. How do you know that you will be able to do it tomorrow? What would you do if tommorow you discovered that you had forgotten how to add up a set of numbers?

4. What does the computer system do when you type

        FORWORD 50

    when you actually meant to type

        FORWARD 50

If the computer were able to understand spoken English, would it be able to understand your instructions in this case? How are computers and people different in their ability to understand and follow instructions?

5. Give an example of something you learned last week and that you have used this week.

6. Give an example of something you have learned today that you expect to use tomorrow. How do you expect to use it tomorrow?

7. What good does it do to learn to add (or spell, or know the names of the states, or etc.)?

8. What if you wrote a procedure

        TO MOVE :AMOUNT
        FORWARD :AMOUNT
        END

How does this relate to the idea of synonyms in English? What is the value of learning new words? How does this relate to learning Logo primitives that accomplish the same or similar tasks?

9. In Logo you can collect a group of useful procedures into a "tool box" that is used later. In what other subject areas is it valuable to create a tool box? In what ways are these tool boxes similar? In what ways different?

Dave Moursund and Sharon Burrowes Yoder, ICCE, 1787 Agate Street, Eugene, Oregon, CompuServe 73007,1645; BitNet ICCE@Oregon.

InLXual Challenges

Turtle Waves

by Robs Muir

In a procedural language, such as Logo, the building block with which programs are made is the procedure. There are many metaphors that map well on to a the concept of procedural programming, but perhaps the most interesting metaphor is that of a *society*.

Marvin Minsky suggests two facts which are important to a deep understanding of procedural programming; "Computer programs are societies," and "any computer can be programmed to do anything that any other computer can do—or that any other kind of 'society of processes' can do." [Preface to *LogoWorks*, Solomon/Minsky/Harvey, 1986]

To my mind, a computational society is populated with individual processes (procedures) that *communicate* in more or less harmonious ways. Getting functional components to work together in concert is the key to efficient and elegant programming.

At the heart of this vision of computing is the idea of communication. In Logo, a procedure may be either an *command* or an *operation*. (In LogoWriter, the latter is termed a *reporter*.) This distinction has a tendency to obscure the idea of a strictly egalitarian computer society, since we have introduced different classes of individuals which people our silicon world—certainly not a democratic ideal. Logo literature is full of discussions about the use of OUTPUT to build operations, and this difficulty helps reinforce arguments put forth by such people as John Allen [*Thinking with TLC Logo*, 1984] that Logo would be better if it were strictly functional, i.e., used only operations.

Without involving ourselves in this social engineering argument, let us turn our attention to those procedures that do indeed communicate. An operation is a class of procedure that (usually) takes an input and generates an output which, in turn, is passed to another member of the society. A good example of an operation is Logo's primitive, SIN. We could diagram SIN in this way:

```
        60
       \ ↓ /
      ┌───────┐
      │  SIN  │
      └───────┘
          ↓
      0.866025
```
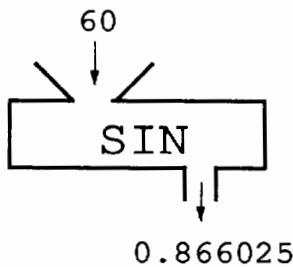
SIN is an operation that gobbles up a number and spits out a new number (the sine) which must be passed on to another society member—that is, another procedure such as PRINT or FD.

We could do some research to discover how SIN behaves. Given a range of input values, say between -360 and 630, we could plot the output of SIN.

Notice that SIN sometimes produces both negative as well as positive numbers always between 1.0 and –1.0.
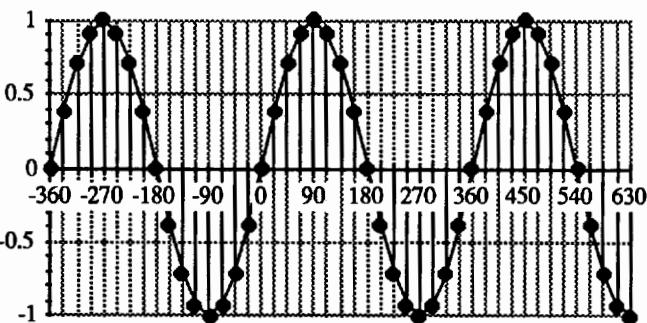
A classy little society of Logo procedures can be put together to allow a turtle to recreate this sine wave. One approach might be to have a turtle move along horizontally, one step at a time, and lay down a dot above or below the horizontal depending on some new value for SIN. We need several members for this sine wave society:

```
TO DRAW.DOT
  PENDOWN
  FORWARD 1
  BACK 1
  PENUP
END

TO WAVE :VALUE
  PU
  FORWARD 1
  RIGHT 90
  FORWARD SIN :VALUE
  DRAW.DOT
  BACK SIN :VALUE
  LEFT 90
  WAVE (:VALUE + 10)
END
```

We can start this all off by typing WAVE 0. (Really, any input will do.)

Graphics
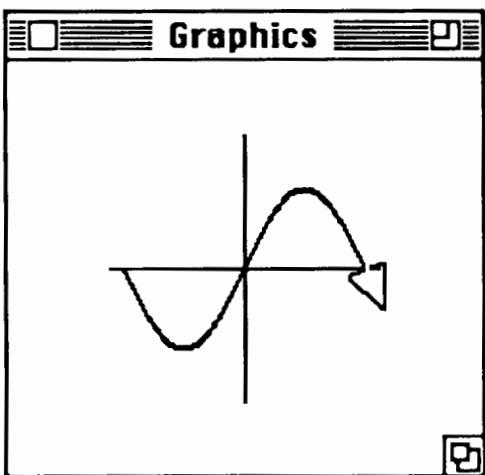
Since SIN always returns a value between 1 and –1, our society draws a wave with an exceedingly small amplitude. We could scale it up by substituting, say,

20 * (SIN :VALUE)

for every instance of SIN :VALUE in the WAVE procedure.

Graphics
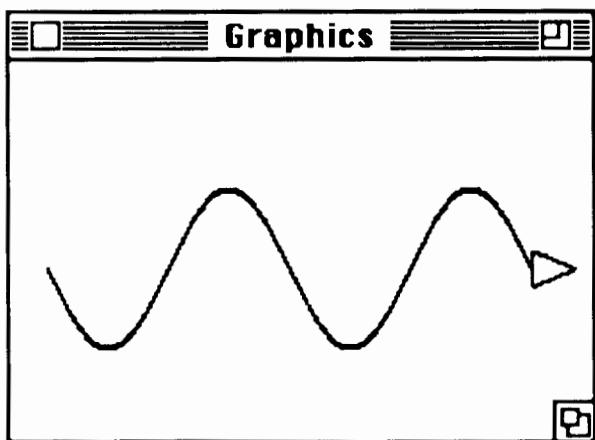
A Simple(r) Challenge

With some minor modifications, it is possible build an truly industrial society capable of producing a vast variety of different wave products. We can change the wavelength, or distance, between the wave crests

or we could change the amplitude using some well chosen input or global values.
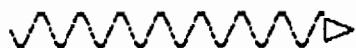
Can you build such a Logo program to duplicate these waves?

Non-Linear Wave Forms

Logo and sine waves have been explored by many people in the Logo community. This is an important environment for student (and adult) exploration which has been put to good use in high school trigonometry microworlds.

You will notice that all of these waves have a shared characteristic; they all have a linear backbone. Why must sine waves always traverse a horizontal x axis? I have never seen any Logo literature which has suggested the possibility of waves that curve, or travel, in non-linear paths. To explore where no one has gone before...

The Challenge

Written in Object Logo, my wave society is a set of procedures which allow me to type FD 100 and see a 100 unit long wave of some predetermined amplitude and wavelength where a straight line would normally appear. This social enterprise allows me to do such silly things as REPEAT 4 [FD 50 RT 90], or HOUSE, or even REPEAT 360 [FD 1 RT 1].

Depending on your version of Logo, you might choose to redefine FD or simply use a procedure called WAVER.

The following series of snapshots demonstrates that there is a rich world to be tapped when waves curve. Each of these pictures is wave traveling in a circular path. By varying the amplitude and/or wavelength a wealth of different behaviors can result. In some cases, I have had the turtle draw a circle after the fact so that you can more clearly see the wave path.
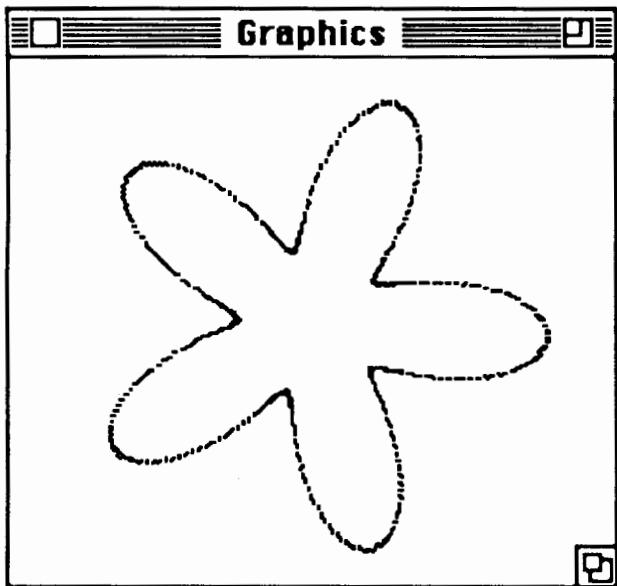
Illustration 1
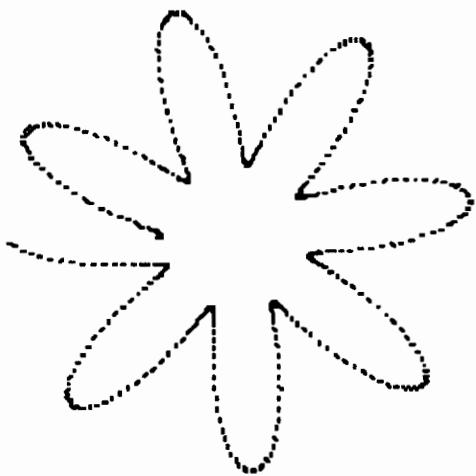
Illustration 3
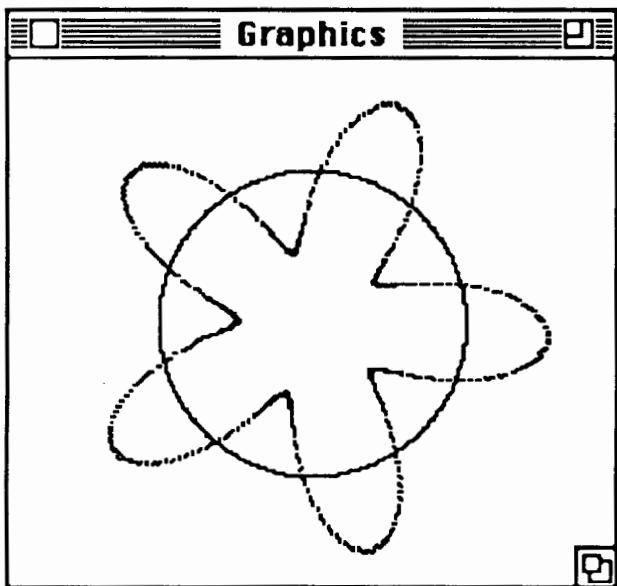
Illustration 2
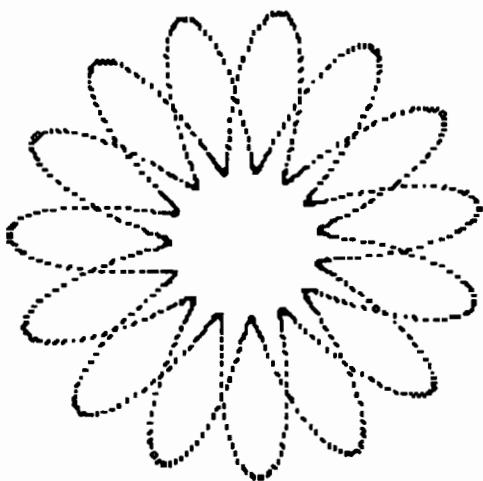
Illustration 4
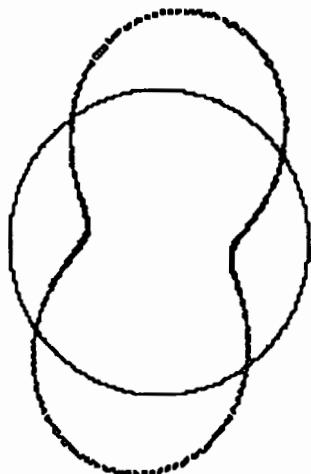
Illustration 5

Illustration 7

Graphics
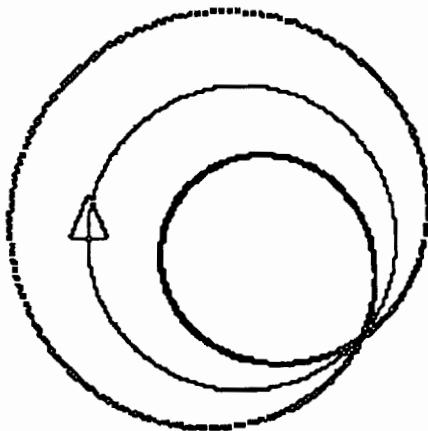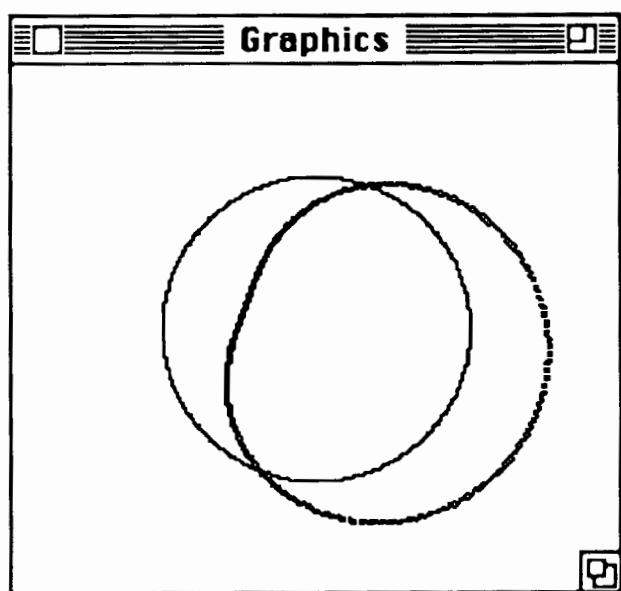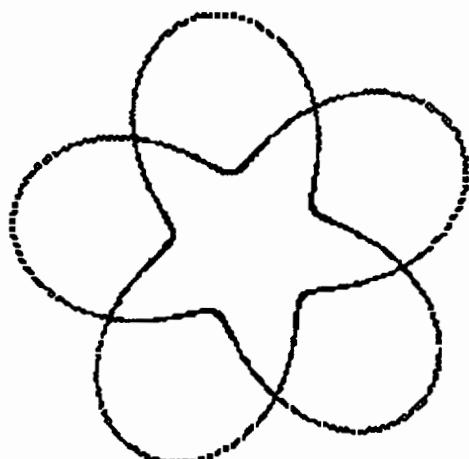
**Illustration 6**

Illustration 8
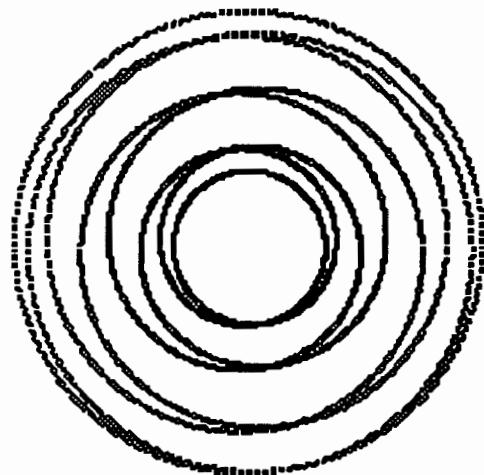
Illustration 9

As you can see there is a wealth of new material to explore with turtle waves. With a well written set of procedures, almost any Logo drawing assumes new character when drawn using waves.

The Wave that Changed the World(view)

In 1923, Prince Louis Victor de Broglie proposed in his Ph.D. thesis that electrons, thought then to be particles, might also have wave-like properties. His argument helped derive the quantized orbits for Bohr's model of the atom. For any give wavelength, there must be specific orbital radii at which a wave will exactly "fit." At other orbital distances, the wave will interfere. (See illustrations 2 and 3.)

Quantum mechanics was developed principally by Heisenberg, Schrödinger, Bohr, and Dirac beginning in 1925. Its effect on modern perceptions of physics cannot be understated. One of its tenants is the belief in wave-particle duality; that is, particles with wave-like behaviors. Did you know that a baseball has a calculatable wavelength? Try that one on your sixth-graders.

Now you know that turtles also have an associated wavelength mandated by society.

Wave bye bye.

With this issue, I reluctantly conclude my series of Logo Challenges. After 41 consecutive articles, there comes a time to break new ground. However, I hope to continue my involvement in Logo on a more private and less regular basis. To all those who have generously shared their Logo source code and intellectual property, I can only wish you continued challenges. FD 100!

Robs Muir, 1688 Denver Avenue, Claremont, CA 91711; CompuServe: 70357,3403; BitNet: MUIRR@CLARGRAD

Global Logo Comments

by Dennis Harper
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China, the Netherlands, and England headline our news this month. Each piece shows that sophisticated Logo activities are being carried out in far reaches of the world. From England comes the announcement of the British Logo User Group's 1988 Conference to be held in the College of Saint Paul and Saint Mary, Cheltenham, from Friday, September 2nd to Sunday the 4th of September. This conference is intended for primary and secondary school teachers, advisory teachers, teacher trainers, researchers in education and anyone else interested in the scholastic use of microcomputers and in the Logo programming language in particular. The conference will include a series of activities for beginners in Logo, and a chance to hear about teachers' experiences in their classrooms; there will be a trade exhibition as well. For bookings or further details write to

The British Logo User Group
P. O. Box 79
Walsall, West Midlands WS5 3RW ENGLAND

I received the following letter from Wu Andong of China (PRC).

Dear International Editor of the Logo Exchange:

I am a teacher of a middle school in Jinan city, Shandong Province P.R.C. It was lucky that I happened to read your magazine *Logo Exchange* in Xian city when I took part in a meeting about the Logo computer language there.

I like your magazine very much but I cannot read it in our city even in the biggest library here. My English knowledge is so limited but I think I can understand most of your magazine if I use an English/Chinese dictionary. I am learning Logo and I am teaching my students about it.

Mr. Zhang Wan-Zang is my good friend. He asked me to translate an article in the Chinese newspaper "China Computer World." I have finished it and I post it to you. I hope if it is possible you will publish it in your magazine for introducing Logo in China.

My translation isn't very good. I think you can correct it after you read it. I hope you will post your magazine to me or write to me.

Thank you very much.
Wu Andong

Thank you for your contribution, Mr. Wu. Following are the original and English edited versions of the article.

制做图文方便的 软汉字Logo系统

为推动 Logo语言在我国的深入普及，北京大学电子仪器厂开展了 Logo 语言的汉化工作，在解剖分析解释系统的基础上，推出 MIT版软汉字 Logo 系统。利用该系统可以方便地制做各种图文并茂的软件封面及计算机辅助教学软件的图形和说明。利用它进行计算机教学，不仅使青少年掌握 Logo 语言，也可学会使用软汉字的方法。

该系统的汉字功能部分是用6502汇编语言实现的，运行速度快，又不占用 Logo 为用户提供的内存空间，不减弱 Logo 的任何功能，且与原 Logo 完全兼容。在该系统下可以使用全部国际一级汉字，可以在 Logo 的图形中书写汉字，英文大、小写字母，数字及各种符号。汉字库放在软盘上，随用随调。

该系统具有屏幕编辑功能，可以用 Logo 语言中使用的编辑功能键移动光标，确定汉字及字符的位置。汉字的检字采用简化的拼音输入法。Logo字符↔汉字间的转换通过功能键实现。在 Logo 程序中也可以使用国标码在屏幕上书写汉字。

该系统是在 APPLE－Ⅱ机（64 K内存）上开发的，它包括一张系统盘和一张字库盘，开机时可以自动一次调进内存。（万增、书仁）

~φ~

A Chinese Diskette Can Make Logo Pictures and Program Conveniently

In order to popularize the Logo computer language deep into China, Zhang Wan-Zeng, an engineer of Beijing University Electronic Instruments Factory, has become the first person to program the Chinese version of MIT Logo based on dissecting and analysing the MIT Logo interpreter system. Using this Chinese diskette version of the MIT Logo language, one can very easily design covers, pictures and instructions of any CAI software. When the youth use the Chinese Logo system for CAI they not only can master the Logo language but also can learn how to use the Chinese character library diskette.

This system has used the 6502 assembly language so that it can recognize the Chinese character function. Its running time is very fast and it doesn't occupy as much space as the old MIT Logo, nor does it weaken any Logo function. It is compatible with the old MIT Logo diskette system. Under the control of the system, one can use all the international Grade I Chinese characters and a part of Grade II. Upper and lower case English letters, figures, and many symbols on the Logo pictures can also be used. The Chinese character library has been saved in the diskette and can be called freely when one wants to use it.

The system has the ability of on-screen-editing. The function key in Logo can be used to move the cursor in order to fix the Chinese characters at a certain place on the screen. To recall the Chinese characters, the system uses a simplified method according to their pronunciation and spelling. The function key is again used to realize the transformation between the Logo and Chinese characters. In a Logo procedure the Chinese characters using the GUO-BIAO-MA (China national standard code) can be written on the screen and the system can display every Logo command in both Chinese and English at the same time.

This system was developed for the Apple II with 64K internal memory, including a system diskette and a Chinese character library diskette; it requires no extra hardware. When the computer is started up, all the Chinese characters and the Logo system can be called into the internal memory at once.

Harry Pinxteren gives us a short description of perhaps the world's most high-powered state-of-the art Logo center.

Logo Centrum Nederland by Harry Pinxteren

Organization Profile: Logo Centrum Nederland (LCN) is a small R&D organization active in the field of AI and education. Currently there are five full-time and four part-time employees (five have an AI background and four are educators). LCN started as a spin-off of the University of Nijmeen and is now operating as a separate, semi-autonomous organization with formal relations with the university's Department of Cognitive Science.

History: The LCN was founded in 1983 and its activities in the field of AI and education are subsidized or under assignment contract by:

- The Dutch Ministry of Education: in the context of a national program stimulating information technology (IT) in elementary and secondary education.
- The Ministries of Education and Science of England and The Netherlands: studies on the feasibility of the implementation of BOXER on microcomputers.
- The EC, both DG5 and DG13: as chef de file of two European projects on applicative languages and education; preparation of the DELTA, TEMPO and ESPRIT II projects; special project (ESF) for training teachers in new IT.
- UNESCO: special assignment to make proposals and plans of action for an international cooperation program on the introduction of an integrated AI based learning environment.
- NRF & others: project on "Informaton Protheses" for handicapped children.
- Dutch Ministry of Economic Affairs: R & D project for the implementation of a small , SCEME based, Logo-like AI environment for primary and secondary education.
- R & D project for the implementation of an environment for the specification of different architectures for various production-rule systems on top of SCEME (specs: Revised³ Report, AI memo 848a, MIT). The working name of this project: PRIS (Production Rule Implementation System) to end in 1989.
- The CEC (ESF): program for training knowledge engineers.

Products/Services
- LISP/Logo interpreter for C64 and IBM PC's and compatibles (EGA/CGA card)
- Logo software and extensions: AIBLE system

- LISP/SCHEME courses
- Consultation on AI and production rule system architectures.

New Activities: New research projects are being set via participation in a project for starting an AI center in the region of Nijmegen/Arnhem (in cooperation with NICI, Nijmegen Institute for Cognition Research and Information technology of the University of Nijmegen). NICI is one of the 12 special University Centers in the Netherlands specializing in IT R & D.

LCN is seeking partners interested in making proposals for joint EC projects in the context of the above mentioned PRIS program.

Further Information:
Contact LX European editor at the masthead address or use
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ARPA: EDH%HNYKUN52.BITNET
@WISCVM.WISC.EDU

LXionary

by Bill Craig

No one who has read a computer education journal or attended a conference in the past few years is unfamiliar with the widespread efforts to integrate computers into the curriculum. These efforts have become a major part of the Logo literature and conference proceedings. While curriculum integration is probably an overused term, it is also a very credible goal. It seems obvious that one of the things we should be doing with computers is using them to teach our subject matter. Reviewed this month are two articles by Michael Battista and Doug Clements which describe procedures written to integrate Logo into the standard middle and high school geometry curricula. What is significant about these articles is the effort to provide specific connections between the Logo environment and the traditional geometry curriculum.

"MATHSTUFF Logo Procedures: Bridging the Gap between Logo and School Geometry" by Michael Battista, *Arithmetic Teacher*, September, 1987.

The connection between Logo and geometry is certainly the most obvious of the possible Logo curriculum links. Battista warns though that

We should be careful, however, that we do not expect that merely working with Logo will improve students' mathematics achievement ... teachers must take great care to create explicit connections between Logo activities and the mathematical topics found in the curriculum.

Battista tries to provide this connection with procedures which draw segments between two points, measure angles defined by any three points, measure distance between any two points, turn the turtle to or move the turtle to any point.

The objectives of activities that Battista suggests with these procedures are similar to those of a middle school geometry unit. Students practice measuring angles, decide whether randomly drawn segments are parallel or intersect, draw a scalene triangle, trapezoid, rhombus that is not a square, measure the interior angles of a triangle, measure the interior and exterior angles of different polygons, and construct the perpendicular bisector of a line segment. Applications of these procedures are described so that the Logo philosophy is preserved in teaching traditional content.

LXionary -- *CONTINUED*

"Using Logo Pseudoprimitives for Geometric Investigations" by Michael T. Battista and Douglas H. Clements, *Mathematics Teacher*, March, 1988.

This article describes MATHSTUFF like procedures for high school geometry teachers. The use of Logo in high school geometry is inspired partly by the authors' belief that most high school students have not achieved a sufficiently high level of geometric thought before starting a proof oriented study of geometry. Battista and Clements believe that use of the Logo procedures described here can help move students to higher levels of geometric thought.

The Logo procedures kit for the high school geometry teacher contains all the MATHSTUFF procedures described above plus a few more. The additions include a procedure which outputs the slope of a line and procedures which translate, rotate, and reflect, and dilate polygons.

The suggested activities are similar in spirit to those described above. The suggested explorations include comparing the medians of several triangles, writing a procedure to test if two lines are parallel, writing a procedure to find a glide reflection of a polygon, and using bisectors to classify quadrilaterals.

I am very excited by the content of these articles and impressed by the theme. Battista and Clements are forcing us to realize that curriculum integration means more than simply using Logo to teach topics in the course syllabus. Integration only takes place when specific connections between the Logo work and the traditional content are established. Defining curriculum integration this way may mean that the range of topics with which Logo is used is decreased. But if applications as well conceived as MATHSTUFF can be identified, the result will be significantly improved instruction.

My only regret is that the procedures from the *Mathematics Teacher* article are written for Object Logo on the Macintosh. The choice of this computer means that use of the procedures as written in the article is possible for only a few teachers. Sacrificing a little programming flexibility or sophistication would put these procedures into the hands of many more teachers.

Bill Craig, Hening Elementary School, 5230 Chicora Drive, Richmond, VA 23234

LogoPals

by Barbara Randolph

Dear LogoPals,

I am currently a library/media center teacher for all the children in my school, from kindergarten to eighth grade. I have also been a reading laboratory teacher, and before that, I taught first through eighth grades at one time or another. This year I have been having fun teaching all the teachers in my school about using computers.

I love collecting stories from around the world and learning some of them by heart for storytelling. Traveling is exciting to me; I enjoy seeing new places and meeting new people. I have been to ten other countries and about thirty five of our fifty states in the USA. I have many more places to visit on my list. I love camping and hiking in mountains and other beautiful earthspots. I enjoy drawing, photography and would like to study art some more. I began drawing when I was very young. I love to sing and to listen to music. I love dancing and biking. Last year I studied sign language. This year I studied massage.

I have one son named Justin. He's a junior in high school. He likes freestyle biking, skateboarding, drawing, reading and studying guitar. He built his own ramp for freestyling this year.

I have two cats. They are father and son. They are part Siamese but look mostly like black and white striped tabbies.

Besides spending time with my family and friends, one of my favorite activities is working with LogoPals. Receiving letters from you and your teachers is a joy for me. I also love the drawings you send and the letterheads you design.

Thanks so much for being LogoPals—you are great!

Check out these delightful letters from new LogoPals looking for that special penpal:

Manar Waheed (Texarkana, Texas, USA): I am ten years old (eleven in October). I am in fifth grade and have been working with Logo since I was in first grade. I enjoy drawing new designs and drawing outfits in Logo. I like swimming, Math, and my favorite thing to do is skate!! I would like a penpal from the USA, maybe from Washington, D.C. so I could learn more about that interesting city.

LogoPals -- CONTINUED

Jamie Johnson (Hornell, New York, USA): I like to collect baseball cards. I like computers. I enjoy Chinese food. I am in the sixth grade. I would like to write to a penpal.

Monica Ceglski (Coraopolis, Pennsylvania, USA): I am eleven years old, and I am in the sixth grade. I am enjoying Logo. I like to read and write. I like to go shopping. Please send me a penpal from Switzerland or from France.

Lowell Nucum (Seattle, Washington, USA): I like Logo, and I like to work with Logo at recess. I like to ride my bike. I really enjoy playing games on my home video game system. I am eight years old and in the third grade. Send me a Logo penpal.

Mary Beth Sheehan (Orchard Park, New York, USA): I like to ski and swim and play soccer and tennis. I love running. I am going out for track. I also love animals. I am ten years old and in the fourth grade. I would like a Logo penpal from France or some other country in Europe.

Jill Miller (Coraopolis, Pennyslvania, USA): I would like a girl penpal from Japan or Germany. I like to write stories, read and do math. I am in the sixth grade and I am eleven years old.

Claudia Freeman (New York, New York, USA): I am from Manhattan. My hobbies are stamp collecting, playing tennis, swimming and sailing. Please send me a LogoPal.

King Lawrence (Texarkana, Texas, USA): My hobbies are gymnastics, football, golf and skiing. I also like swimming and other outside activities. I have been doing Logo for two years. I especially like games and moving procedures. I am eleven years old. I would like a penpal from New York, New York. I have never known anybody from a big city.

Robert Aszkler (Orchard Park, New York, USA): I am in the fourth grade. I am ten years old. I like Logo. I also like Science. I enjoy fishing. I caught a Yellow Pike. Please send me a boy penpal.

Sarah Cosman (New York, New York, USA): I would like a girl penpal from California. I am ten years old. My hobbies are swimming, reading and playing games. (I would like my penpal to be ten also.)

Teachers, would your students like to become Logo penpals? Have them write to me telling their age and grade,

hobbies and interests, and their favorite Logo activities. They can also answer these questions: how long have they been studying Logo? Who is their Logo teacher? Which months of the year is their school in session?

Students can be matched with any of these boys and girls listed here or others we have in our LogoPal network. When possible, we match them with students from the places they request. Excerpts from the letters they send may be published in the column. (When they receive the address of their new penpal, they will then write another letter introducing themselves to the student with whom they have been matched).

Children in the USA need to send a self-addressed stamped envelope. Those outside the USA should enclose international postal coupons (purchased at the post office) for a 1-ounce or 28 gram reply.

IMPORTANT: LogoPals is "open" all year round! If you have a special address for your vacation or holidays, make sure you let your LogoPal know what it is. You can write to me during my summer vacation during July and August at the usual address:

LogoPals, c/o Barbara Randolph, 1455 East 56th Street Chicago, Illinois 60637, USA

P.S. Special thanks go to Sharon Yoder, our new Editor-in-Chief, and Tom Lough, our Founding Editor, (and Posy Lough) for their continuous support and encouragement for the LogoPals network. I am also grateful for Andy David's technical assistance and shared enthusiasm for this project—thanks, Andy!
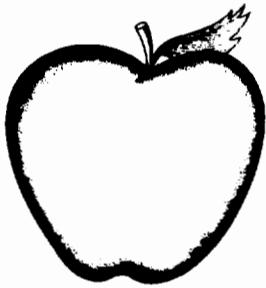
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Logo

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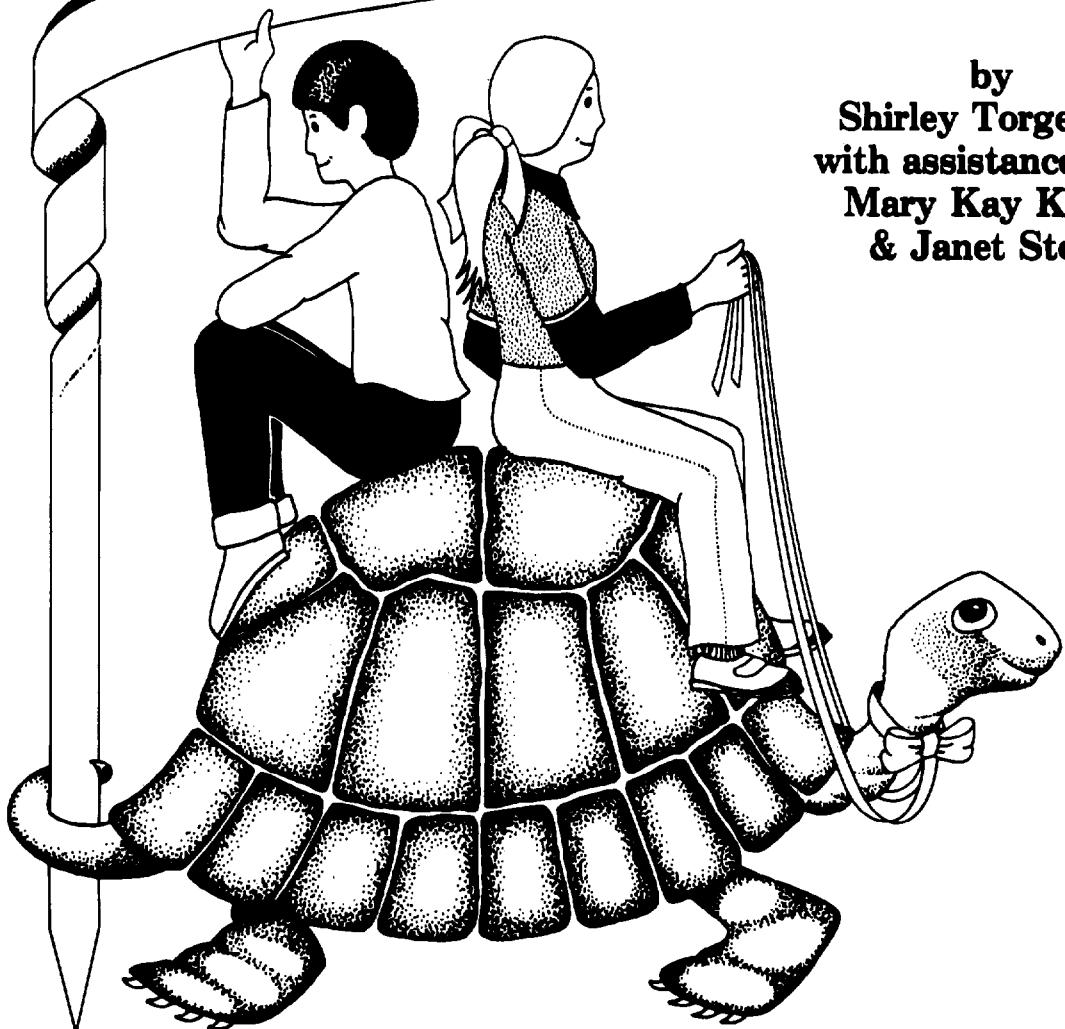
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