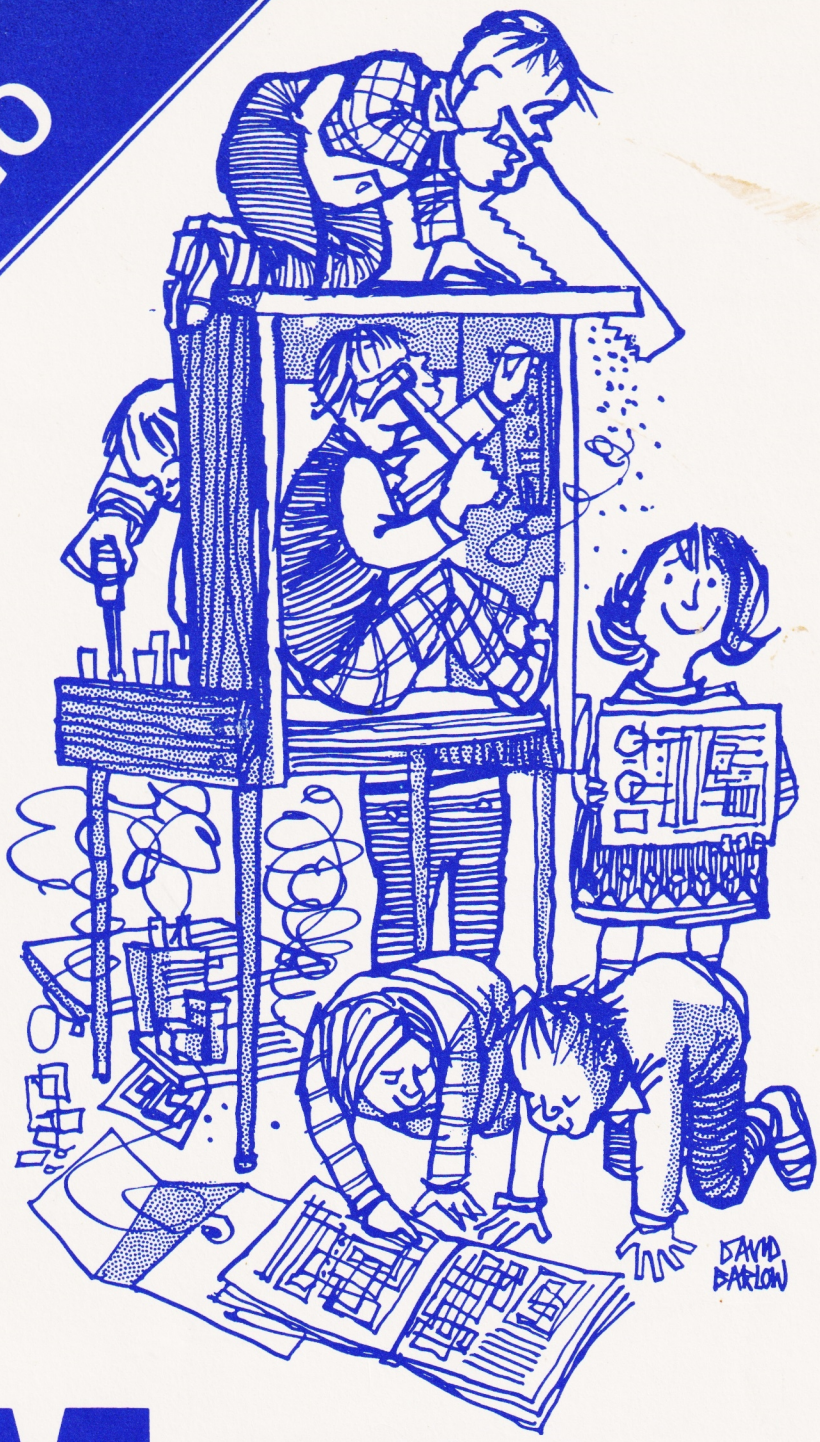
LOGO

SPECIAL
DECEMBER
1987




# MICRO SCOPE

Newman College, MAPE and BLUG

# Contents



*The turtle drawings are taken from Reg Eyre's book (see page 32).*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# MICRO-SCOPE LOGO SPECIAL

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# Introduction

Welcome to the second MAPE Logo Special.

We hope you will find this book useful as a source of ideas for you to try with your class. We have assembled a number of teachers' reports on what they have done with their children together with other ideas which develop further what each teacher has just described.

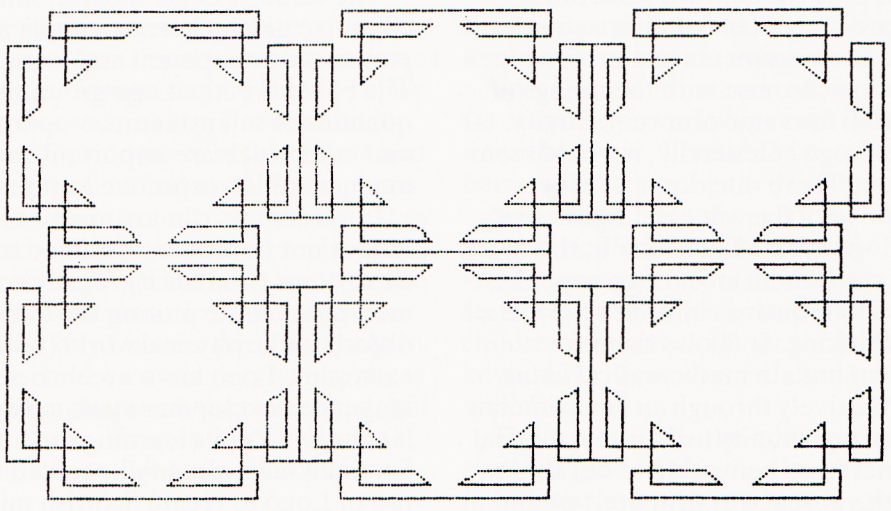
Logo is only one development among many that demand teacher time and it must be considered amongst all the other curriculum issues. Most teachers have heard of turtle graphics and the wonderful panacea it is for all curriculum ills! What we hope is that you might identify with some of the experiences described and be tempted to develop further your usage of this educational wonder-drug.

The first part of the book is concerned with the use of floor turtles and turtle graphics. For this work it is only necessary to have access to a turtle graphics program such as *Dart, Arrow,* etc. The rest of this book requires the use of a full Logo and has been written using Logotron Logo. All the work described using sounds, adventure games, control technology, etc. can be done in other implementations of Logo with minor variations in the commands.

We hope you 'dip into' this book for new ideas and leave it where children can also access some of the 'things to try'.

Have fun!!

LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...



# What is Logo?

In the Logo environment the child, even at pre-school ages is in control: the child programs the computer. And in teaching the computer how to think the children embark on an exploration of how they themselves think.

**Logo provides a natural and concrete tool** 'for teaching children to be mathematicians, rather than teaching them about mathematics' (Seymour Papert, *Mindstorms*, 1982.)

**Logo can** also **be used to explore** physics (through sprites); control technology; music; language and artificial intelligence (using list processing).

**Logo is a language for learning** and has been created to make it easy for the user rather than the computer.

**Logo is extensible**. Users can create microworlds based on their own interests. This makes learning personal. However, Logo procedures can readily be shared and adapted by others.

**Logo is flexible**. There are few thresholds or limits. This means that very young children or older students can use it at their own level. Logo syntax is relatively simple.

**Logo is interactive**; you can see the result of what you have typed straight away. The screen may reflect your thoughts, and the Logo editor makes it easy to change your ideas.

**Logo is procedural**. A complex task may be broken down into mind-sized bites.

**Logo is ideal for learning how to solve problems.** Making mistakes, finding them (de-bugging) and then deciding what to do about them is an essential part of writing procedures.



# Why Logo? (1)

**Derek Radburn**

Logo is like sex. It has ends beyond the immediate activity. Like sex, Logo, too, is occupying a more open profile in our society, but as with sex, practitioners are sometimes reticent to discuss the details of their activities.

There can be few arguments in a profession whose fortunes synchronise with the swings of the birth-rate as to the value of sexual activity. Is the same true of Logo? Generally, it would seem the answer is yes. There does appear to be a growing perception of the value of Logo activity.

What does Logo offer? Let's look at the primary classroom (where most Logo happens). Logo is claimed to improve children's powers of mathematical thinking. It allows them to generalize and assimilate mathematical ideas and concepts intuitively through an environment which offers the opportunity to do mathematical things, as distinct from being told about them. Fine! Despite the absence of firm pre-test and post-test research evidence to back this, any voyeur of Logo will attest that children generalize more readily after Logo confrontations. But this is to mark the obvious, as with sex, all is not what it seems.

The value of Logo does not simply lie in mere cognitive gain. There are implications upon personal development and social behaviour. The benefits of the Logo group situation nurture qualities of self esteem, co-operation, and give and take which are important in any society not made up of introspective hermits.

Logo activity can assume so many forms that it does not have to be confined to primary classrooms (nor has it). Turtles can provide fine metaphors for exploring the behaviour of objects in the physical world (falling feathers for example). Logo has scarcely been used for language development yet, never mind foreign languages. Pupils learning the history of Scotland have already benefited from an early use of Logo to create Scottish microworlds.

Logo will fit in the curriculum, even the 'nasty' curriculum proposed. It will become

more useful and valuable as the Logo implementations and the machines hosting them become more powerful.

In a time when many educational idealists are feeling depressed, practitioners of Logo ought not to; they have something potent and flexible. After all, what would happen to the human race if everyone gave up sex when the going got tough? One final thought, I wonder what Freud would have made of Logo and its language?

(*Note:* The author of this article accepts no responsibility if this did not reach you in a plain brown wrapper. Just be careful who sees you reading it!)

# Why Logo? (2)

**Sue Marlow**

As a Maths Advisory Teacher I hold a privileged position in that I travel around Gloucestershire visiting schools.

Through this work there is one experience which never fails to excite me! It sends a tremor down my spine every time I think about it.

It is not admiring the amazing drawings which are traced out by the turtle or the fantastic antics the robot gets up to or the games it plays, gliding around the floor.

It is watching the expressions and actions shown by those children who are observing the turtle moving for the first time.

Wherever I go, whoever I'm with (. . . have I heard that somewhere before?), those aged from four to forty-plus, it's always the same! Wide eyes in wonderment, following the moving turtle; still bodies, daring not to move, and the silence, save that of the turtle . . .

Sheer delight is experienced by all – not just the young. And afterwards when the turtle has stopped, the atmosphere is electric; no-one dares to speak. Then a whisper is heard:

'What else can it do?'

I wish that I could capture these moments, but there's one thing I'm sure about – I'm going to experience them again and again . . . and again.

# TIG
## *(Turtling in Glevum)*

**Mary Oliver**
*Bishop Cleeve Infant School, Cheltenham*

I work in a large primary school with over 400 children. In the infants department most classes have the computer for one day a week. My class of 32 four and five year olds are experienced computer users. During the year that I have had this class I have tried to find and use programs where the children are in control and where they are using the computer as a tool to achieve their aims. Several of the programs have involved the use of the concept keyboard. In the afternoon on our computer day I have a parent to help by sitting with the children at the keyboard; she is extremely good as she resists the urge to tell, but instead asks the sort of questions which encourage children to think things out for themselves.

At the MAPE Conference in Cheltenham in 1985, Marie Buckland demonstrated the use of the Jessop turtle controlled by the concept keyboard for infants with special educational needs. I was very interested but because our Concept Keyboard plugs into the user port, as does the turtle, I could see no possibility of our being able to use the turtle in this way.

Some time later at our local college I saw a program called *TIG* (Turtling In Glevum) which is the name given to a set of seven files which form a structured sequence which allows young children to control a floor turtle via a concept keyboard. These files are used in conjunction with *Dart*.

The turtle needs the addition of two ears, red on the right and blue on the left, and eyes and a mouth to show which way it is going.

The overlays for the concept keyboard have pictorial representations of the ears for turns,

arrows with numbers for different distances forwards and backwards, and a turtle shape for Go. You can lift or lower the pen and sound the horn. The first overlay includes only 90 degree turns and one distance of forward movement. By the seventh overlay there are 10 forward distances, 5 backward and 30, 60 and 90 degree turns.

I was told about a multiplexer which would enable the use of both the keyboard and turtle at the same time (a multiplexer is a sort of adapter: one end plugs into the user port, then the turtle and concept keyboard plug into a box on the other end).

I had to think about why I wanted to use the turtle with such young children. What did I think they would get from such use? Where did I think we were going? It was the type of program I had been looking for because the children would be in control, controlling the computer rather than being controlled by it. As to where we are going, that depends upon the individual child; they can go as far as they want in the direction they want with no restraints (beyond the length of the turtle cable), and to go on to other forms of Logo as their needs dictate.

With help from Sue Marlow, one of our advisory Maths teachers and Reg Eyre at the College of St Paul & St Mary, Cheltenham, I was loaned a multiplexer.

We started by just looking at the turtle. What did they think it was? What did they think it did? How could they use it? There was certainly no shortage of ideas. They quickly saw that there were wheels, and wheels meant movement; they also decided that the computer was not there without purpose; obviously it worked with the turtle as there was a cable connecting them. They saw the connection between the ears on the turtle and the ears on the overlay and then there was a rush to 'have a go', to see what happened when they pressed the overlay. Everybody wanted to see what they could make the turtle do. It is a good thing turtles cannot get dizzy, although they can tie themselves in knots! When I explained the program was named *TIG* they called the turtle Tig or Tiggy.

At first it was just a case of pressing the various symbols on the concept keyboard and watching what happened; there was no pattern, no attempt to go anywhere or achieve any goal. All had to have a go that afternoon . . . no easy task!

Next we tried simple tasks. Skittles, knocking over piles of bricks . . . football, pushing a ball through goalposts . . . directing Tiggy to visit other children or puppets from *1, 2, 3 and Away*. All very popular. When it was not our day for the computer we put red and blue mittens on children and directed them to do various activities. The success of this depended upon the ability of the child to take steps as instructed and not to do their own thing! At first I had to be Tiggy but later some children proved capable of doing just what they were told.

We talked about where Tiggy had been and how Tiggy could draw with a pen. Large sheets of paper were taped to the floor and children drew pictures with Tiggy. They tended to have an idea of what they were aiming for when they started but this soon disappeared when things did not go quite as they expected. Then the object seemed to be to get back to where they started from, by any route at all, whether long or complicated or the most direct. The length of the movements on the early overlays was very limiting and we rapidly moved through them to find the most suitable for each child.

The length of the multiplexer and concept keyboard cables combined enabled the children to move around, to orientate themselves with the turtle, to see which directions to give. Arguments arose:

'Red ear.'

'No, blue ear.'

'No it's red . . . I told you it was red, . . . now do red again, . . . that's better, . . . and again, . . . now it's right.' They proved very adept at correcting wrong moves and getting out of trouble.

The last picture drawn this term was Leon's. He started by making a sketch so that he had in front of him a constant reminder of what he was aiming for and a check as to how far he had gone. He drew an elephant with a curved back. A discussion arose with the parent helper as to how Tiggy could cope with curves. He said later 'It has to go up and then there is a corner bit, then another corner bit.' He did not try manoeuvering Tiggy with the pen up – that was too complicated a task and likely to discourage intricate designs – but instead he lifted the turtle and repositioned it to draw the leg and the head. The tail he added by hand later; it was not on his original plan. Leon was very pleased with the finished drawing. I was most impressed when I saw the eight foot animal as I had not been with him when he was working on it – there was no mistaking what it was.

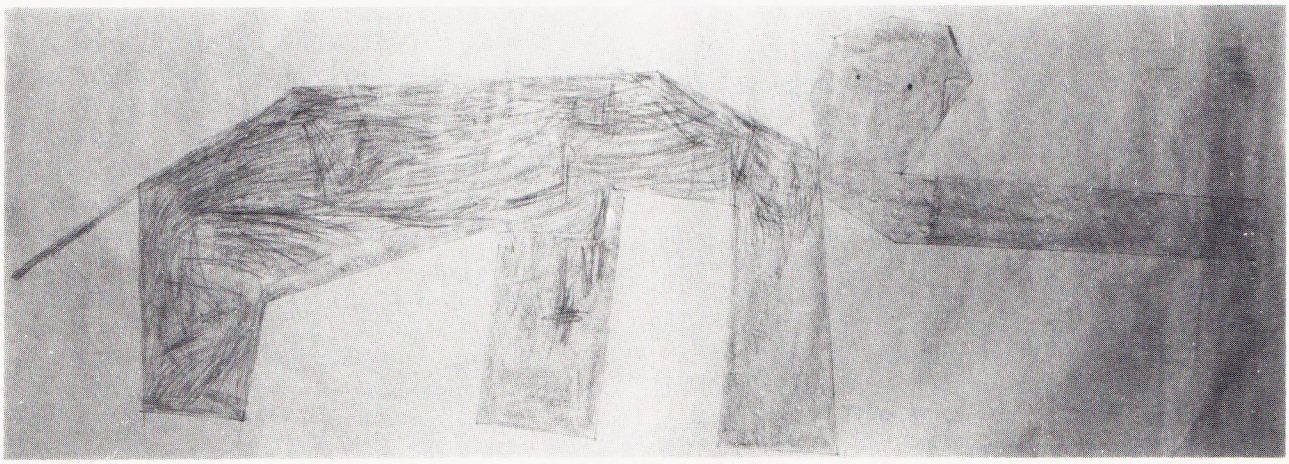
If this is a mark of what can be achieved in a term and a half, with other programs in use as well as *TIG*, how far can these children go before they leave their primary school?

# A suggested progression for Logo activities

The following diagram is a suggested development for Logo learning experiences. It is not a definitive, authoritative, statement of what we should be doing, but a collation of what has been observed in a lot of schools.

It is intended to show that a continuum of Logo learning experiences is possible throughout a child's schooling. The positioning of any item is approximate and will vary from school to school and from area to area. It is one more document for discussion when we are trying to decide the role of the microcomputer within the context of the curriculum.

| | *Infant* | *Junior* | *Secondary* |
|---|---|---|---|
| Turtling (Mathematics) | Experience of movement related to robots; Work with a floor turtle | Work with a screen turtle | Specific mathematical relationships; Multiple turtles; Sprites; 3DLogo |
| Robots | Directing each other; Big Trak; George; Jessop Valiant Zero2 | | BBC Buggy |
| Control Technology | | Top level commands; Writing procedures to sequence actions | Feedback using sensors; Making sensors for specific feedback; Self contained programmable robots |
| Programming | Top level instructions; REPEAT | Writing procedures; recursion; variables | conditional statements |
| Adventure Games (Language) | Playing adventure games | Writing adventure games; Using lists and conditional statements | Disc filing techniques |
| Music | | Playing with notes at top level; Writing tunes | Using the computer as a base for accompanying musicians |
| Abstractions in Thinking | Self contained | Separating instructions from movements; Moving into programming | Developing programming skills |



*Leon's elephant.*

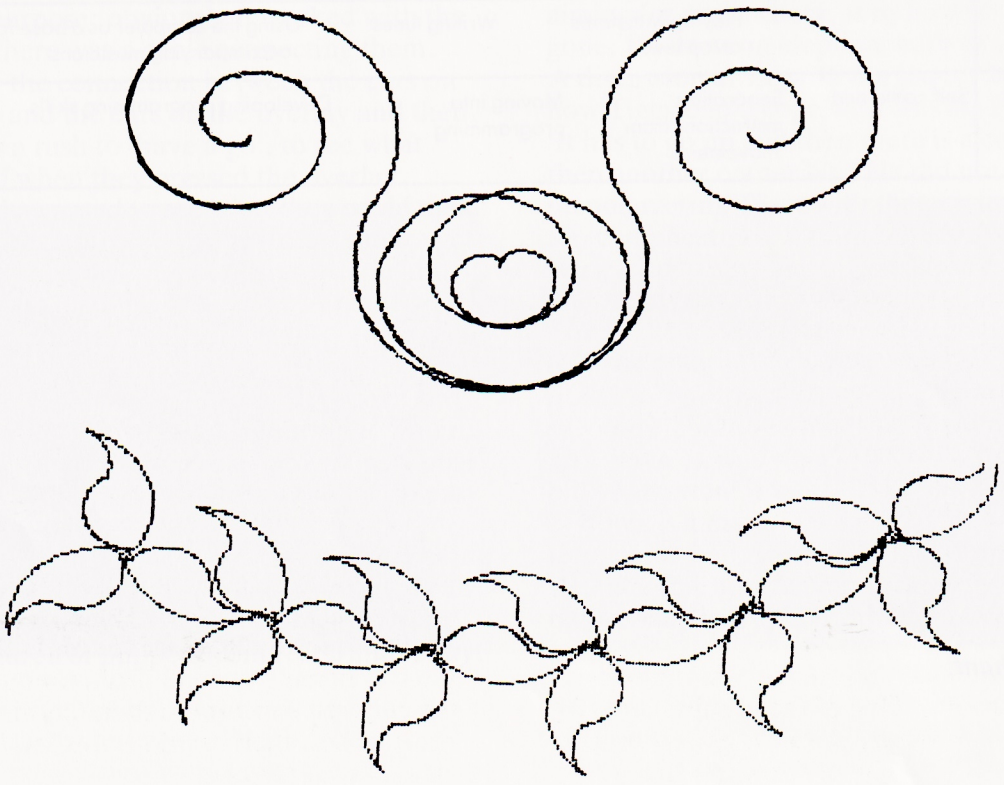
# An important match

**Ian M Leech**
*Senior Master, Westlands Special School*

Snow had pushed its way over the Welsh Hills and into Gloucestershire overnight. Being a Primary Special school which is one hundred per cent dependent upon the children being taxied in by car and bus I had six children in the whole of the upper part of the school. One of the three teachers from my end of the school was snowed in so I bravely took on all six. Which child wants to work in these conditions?

We pushed all the furniture back, turned two tables on their sides and brought in two PE benches. These formed the frame of a hockey pitch. We made some goals out of rolled card and then taped rolls on one side of each of our two turtles. Next door's computer was 'stolen' and set up with the Logo controls while my class computer was used to control the other one. Using the red 'f' keys and a foam 'hockey' ball we soon had an exciting tournament on the way. We also found that it was not all that easy, especially when the rules made by the children included only a very short time to give just two instructions to the turtles.

The headmaster appeared, hearing the excited calls of the children. Even headmasters will be boys so he challenged our champion to a game. It was very close. Soon all the head had to do was to sweep left about 30 degrees to score. The other turtle was well out of position. He then found out that, under pressure, even head teachers can lose their sense of direction. He pressed f3 which gave him RIGHT then 360 degrees as an overkill. A beautiful home goal and Mark was chaired off as overall champion (after the children had stopped their hysterical laughter). It's a good job Mr Bellingham has a sense of humour!



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# Ideas for Using the Turtle

Connect the turtle to the computer and load the software you need to drive it.

Can you:–

(i) Drive the turtle around an obstacle course?
(ii) Make the turtle knock a ball through some goal posts?
(iii) Direct the turtle to demolish your obstacle course?
(iv) Write procedures to do these?

You could try:–

(v) Dressing your turtle as a ship and navigating it around a coastline;
(vi) Dressing your turtle as a delivery van and getting it to post hoots at various addresses;
(vii) Placing the turtle under a chair and driving it to park under another chair;
(ix) Planning a slalom course for your friends.

**Fun things to try**

Put a nose or arm, made from a toilet roll tube, on the front or side of your turtle. You could add another later to make the game more fun!

Can you:–

(i) Score a goal with the ball, using only the arm, or nose?
(ii) Knock down a tower with the arm or nose?
(iii) Put a pen at the end of the arm or nose, and draw shapes? These can be more interesting than the shapes appearing on the screen. Try using different coloured pens in each holder.
(iv) Drive your turtle through a slalom course. Make it more difficult by dribbling a ball through the course?

LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...

# Logo and Young Children

**David Kitching**
*Shanklin C.E. Primary School, Isle of Wight*

'Logo and Young Children' was a project undertaken in a First School with children aged 6 to 9, during the period between June 1985 and February 1987. The project was part of the UK/USA Microelectronics Seminar organised by the National Union of Teachers (UK) and the National Education Association (USA). The project report, of which this article is but a summary, was presented at a seminar in Seattle, USA in May 1987 along with reports on 40 other classroom-based projects.

It was a very great privilege to be part of this international project whose very broad aim was to bring together American and English teachers to discuss how the 'computer' was being used in their classrooms. One of the requirements for each of the participants was to undertake some form of innovation involving either the introduction or the extension of the use of the computer in the learning environment. My project was to introduce Logo to my class.

I wanted to give the children a 'considerable' exposure to Logo because I wanted:

1. to gain some form of appreciation and a deeper understanding and insight of its possibilities in the learning process;
2. to see if and how it could be integrated into the primary curriculum;
3. to see how the curriculum could then be enhanced and extended;
4. to gain some understanding of how such a radical change to the curriculum would affect the children concerned, their learning experiences, their relationships, and their attitudes to learning.

During the two years, summer 1985 to spring 1987, I taught three classes of 6–7 and 7–9 year-old children in a Group 3 First School. The children had available a BBC B with *Dart*, later *Logotron* and a floor turtle. Although the computer was available it was not always in use – there are many restrictions and demands in the primary classroom/school, but it was used as often as possible.

The following passages describe some of the things that we were able to achieve as we explored Logo together.

This class was one of 6–7 year-olds, and the computer was new to them. As a group we spent some time looking at and thinking about the floor turtle – very rapidly known as Terry.

What is it?
What is inside?
What are the wires for?
How many wheels are there?
Why are there so many colours in the cable?
Can we touch it?
What can it do?
How far will it go?
What are Robots? etc. etc.

The questions were intense and it was a joy to be with the children as they made suggestions and thought of reasons as to why it should be. 'If you connect it to the computer it will go!' said one bright spark. We did – but it did not.

More discussion – machines, including computers don't go by themselves; we have to tell them what to do. 'It can move!'

Then I gave them an introduction to elementary ideas and the primitives FD BK LT RT, always relating these back to real life situations. When they were confident and they wanted to try something out, the children were given access to the computer to do or just to watch, to experiment and to make Terry move. They felt a sense of real achievement and excitement when they had made Terry move under their own control.

At this stage each child had probably had about two hours' access each week, working in a group of two or three. During the next few weeks they started to create problems for Terry, and themselves. They introduced obstacles etc., they created landscapes, and they got Terry to act out sequences of actions relating to a story.

Some of the children needed a lot of help and were anxious not to make mistakes, others were happy and indeed demanded to be left alone. We played what I call 'people programming', and gave one another sets of instructions. We painted pictures, wrote stories, and made models. The children gained confidence in their ability to handle this new addition to their classroom environment. The computer was situated outside the classroom in a shared area, but they could see and hear everything that was being done, they were always interested in it, and it quickly became an acceptable and normal part of the school day and the children's work.

The children would often offer help and suggestions to each other or just watch – fascinated.

They began to make the problems more difficult:–

1. Taking Terry for a walk.
2. Visiting friends.
3. Going shopping.
4. Exploring the moon.
5. Searching for a . . .
6. Driving Terry into very small spaces.

The children were starting to make serious demands on their own skills and abilities – they wanted to learn how to do it better. Their enthusiasm spilled over into other curriculum areas – painting, stories, maths, and movement. They were talking 'Terry Turtle' talk all the time and they were starting to see their world in a different way.

At this point several children suggested that we make a maze for Terry – and a maze was made on the floor with coloured tape. There was little input from me, the children were motivating themselves:–

1. Can you drive Terry around the maze without touching the sides?
2. How far is it all the way round?
3. How quickly can you go round the maze?
4. How many commands does it take?
5. Can you drive Terry around the maze only using 30 or 20 or 10 commands? Or even 1 command?

The maze was an interesting stage, it took the children's energy and enthusiasm and focused it on a very specific set of problems. Their concentration grew, they were eager, they were planning precisely what they wanted to do, they were starting to record their work because they did not want to waste their time at the computer. Their time with Terry was very important.

Of course, sometimes things went wrong, the children had to question me, each other, the parent helpers and the Logo books:–

1. What happens if . . . or when I . . .
2. If I do this that happens . . .
3. I think that . . .
4. Why not . . .
5. Shall I try . . .
6. It should have done this but it . . .
7. If I was Terry I would . . .
8. I'll do it again.

It was an exciting period.

Slowly, the children became aware of the screen turtle and the fact that it was tracing the same shape on the screen as the turtle on the floor. There was a sudden realisation that they could control the computer as well as the turtle. 'Terry can draw on the screen!'

'Would you like him to draw on the floor?'

PU and PD were introduced following an intense period of drawing with Terry. Firstly we experimented with free drawing, slowly becoming more precise and careful. Then we planned a drawing and copied it, making a precise and exact drawing by measuring and estimating the sides and angles. A period of great activity and interest ensued. The children wanted to work and they had great pride in their achievements. As they were sharing their skills and expertise with one another, they were growing in every way.

The work was becoming complex. The children were working at their limit: they were being mathematical, creative, inventive. They were totally involved and absorbed in their work. Each child was making discoveries, each having something of real value to contribute.

Then accidental discoveries occurred: 'You can give him lots of things to do at the same time!'

After this, there were hundreds of experiments in getting 'programs' right and making them do just want they were supposed to do. Some children were ready to leave Terry behind because they could no longer wait for him, as they had so much that they wanted to do. At this time, some children were starting to appreciate the need for REPEAT, they wanted to Edit their work, they wanted to save their work on disc, and they had discovered Mode 2 with its many colours. They had begun to have enough confidence to really explore the Logo world; they were ready. From this time onwards the children went in many different directions.

One morning two children were involved with Terry. They were of average ability. In their maths work they were involved with the addition of numbers up to 20; with Terry they were happily and confidently working with numbers in the 100s. They were accurate in their estimation of distance, fairly precise in their handling of angles, and they had discovered 90 degrees (the right angle)!

So, do we underestimate the ability of children?

Another child, a reluctant learner, liked the computer but only in school time, never in his own time. He gave little but demanded much. Our topic was 'Flight'; we had made hot air balloons and he wanted Terry to draw one – but how? Slowly during the course of one morning he and two friends gradually discovered Logo's approximation of a circle. It was a noisy process with much waving of arms and walking round and round. Everyone was keen to hear of his news, and soon everyone was using circles, arcs, spirals and curves.

The work described here involves only a small part of the activities undertaken during the two year period. It illustrates how we started to explore the world of Logo together. It demonstrates that, even with little input from the teacher, children are able to take control of a new idea, to explore it and explore with it, to extend it and to integrate it into their regular school work and learning. The two years were interrupted many times by events within the school and the progress that was being made by the children at those times was halted. Thus the work was not always continuous. It was a valuable and exciting period in the classroom and much was achieved. Starting from a careful, elementary and reluctant beginning the children have learnt to work together, to share their knowledge, to have the confidence to explore and become lost as they created and developed their own ideas.

In February '87 they were still drawing with Terry; they had discovered Logo music; they were experimenting with simple list processing; they had come to terms with variables; they explored recursion; they were writing complex programs. They were enjoying working with the computer.

They explored space, movement, sequence, control, progression, process. They discovered length, distance, angle, right angles, position, relationships, elementary algebra and they had written their own algorithms. They have taken their Logo knowledge across and into every area of the curriculum. They have used their Logo knowledge to enhance and enrich their learning as they have examined the world around them.

The integration of Logo into the curriculum will never be easy, as it raises many profound questions for the teacher, for the school, for society and indeed for the learner. The possibilities are many; its scope is endless.

My work has shown me that it is worth persisting with Logo. We all have much to learn from using Logo with children and from having the confidence to give children the freedom to explore the Logo world themselves.

Logo in the classroom is very demanding on the teacher and the child. I would suggest that some of the following activities should be considered as important aspects in any Logo

work; they will most certainly be part of my future work:

1. to have regular report back sessions from the children;
2. to have more class/group discussions;
3. to encourage recording of the planning, editing and execution of the work done;
4. to have a wide range of Logo material, including books, magazines, utilities, example programs etc. available for the children to look at;
5. to encourage parents to take an active part in the exploration, by giving them access to Logo and by giving them the chance to learn with their children;
6. to involve as much of the school and as many other teachers as possible;
7. to have the richest Logo environment possible;
8. to encourage the children to use Logo to express their other work;
9. to use the Logo activities within the classroom rather than outside it;
10. to do more 'people programming';
11. to allow the children all the time that they need.

# Patterns

**Repeated graphics**

Type in the following two procedures.

```
TO KEY
FD 100 RT 90 FD 100 RT 90 FD 50 RT 90 FD
50 LT 90 FD 50 LT 90 FD 100
END

TO LINE
REPEAT 8 [KEY]
END
```

Now type LINE.

Change LINE using the editor to the following:–

```
TO LINE
REPEAT 8 [KEY RT 45]
END
```

Now type LINE again.

Can you:–

(i) Change the KEY shape to one of your own design?
(ii) Make a rectangle with this KEY shape as a border?
(iii) Make various regular polygon border patterns?

Now type in the following procedure.

```
TO KET
FD 100 RT 60 FD 100 RT 120 FD 50 RT 60
FD 50 LT 60 FD 50 LT 120 FD 100 LT 60
END
```

Can you:–

(i) Alter the LINE procedure to repeat KET?
(ii) Make the line of KETs horizontal?
(iii) Put the KETs around rectangular or polygonal borders?
(iv) Write a procedure which has curves and can be repeated?
(v) Alter the size of the various key shapes?
(vi) Make the key shapes grow as they are repeated?

**Variables with Repeated Patterns**

Type in the following procedures:–

```
TO AGAIN :TIMES :SIDE :ANGLE
RT 90
REPEAT :TIMES [KEY :SIDE :ANGLE]
END

TO KEY :SIDE :ANGLE
FD :SIDE LT :ANGLE FD :SIDE * 2 RT
:ANGLE FD :SIDE * 2 RT 180 – :ANGLE
FD :SIDE RT :ANGLE FD :SIDE LT
:ANGLE FD :SIDE LT 180 – :ANGLE FD
:SIDE
END
```

Now type in AGAIN 8 50 90

Do you recognise this? Now type in AGAIN 8 50 60, remembering to clear the screen. Now try AGAIN 8 50 120.

Can you:-

(i) vary the number of repeats and/or the side length so that the keys join up?
(ii) Spot anything about the two examples above?
(iii) Make the keys fit around regular polygons?
(iv) Make the keys fit around rectangular borders?

Change the AGAIN Procedure to the following.

```
TO AGAIN :TIMES :SIDE :ANGLE
RT 90
REPEAT :TIMES [KEY :SIDE + 15
:ANGLE]
END
```

Now type in AGAIN 10 15 90
Can you:–

(i) Make the key grow and diminish in size?
(ii) Investigate what happens if the angle changes each time?
(iii) Investigate what happens if both the side and angle change each time?
(iv) Put the growing and diminishing key pattern around a rectangular border? a regular polygonal border?

**A Screen Game**

*Radar*

Mark concentric circles on an OHP slide and place it on the VDU screen so that the centre of the circles is over the screen turtle. Type in the following procedure

```
TO SEEK :BEARING :DISTANCE
CS
RT :BEARING
FD :DISTANCE
BK :DISTANCE
HOME
END
```

Player one puts a 'blob' on the screen. Player two instructs the turtle to find the 'blob' by typing in SEEK followed by two numbers, where the first number is a three figure bearing, and the second number is a distance.

The turtle will turn through the angle and move forward and back the distance specified before resetting itself (eg. SEEK 045 150).

A scoring system can be devised.

**A Doodle Game**

Type in the following two procedures:–

```
TO TURN
MAKE "KEY RC
IF :KEY = "R [RT 20]
IF :KEY = "L [LT 20]
END

TO DOODLE
IF KEY? [TURN][FD 2]
DOODLE
END
```

To make this work:–

Type in DOODLE (return) and control the turtle's movement by pressing the R and L keys. Press the escape key to stop the game.

*Explanation*

RC means Read a Character from the keyboard, so MAKE "KEY RC means that the variable name KEY will have the value of the letter pressed by you on the keyboard.

Can you make the doodle go quicker by changing the amount the turtle goes forward? What about changing the degree of turn?

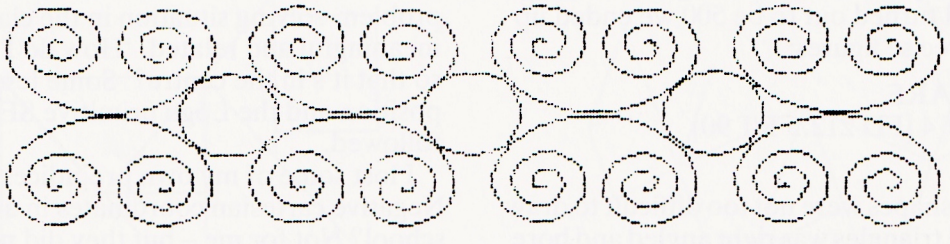
Add the following lines to TURN:–

IF :KEY = "U [PU] for lifting the turtle's pen
IF :KEY = "D [PD] for dropping the turtle's pen

Try to draw a race track on the screen before typing DOODLE and invite a friend to steer the turtle around it.

Can you:–

(i) Add a line to TURN to make the turtle draw a dotted line?
(ii) Make the turtle beep when you press B?

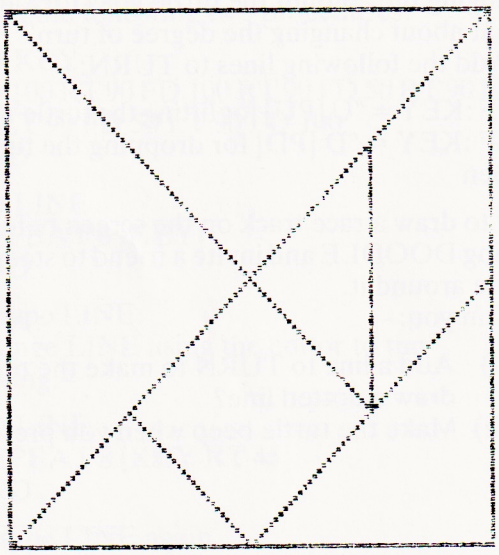


# The Tangram Project

**Will McCallion**
*P.6 Elmgrove Primary School, Belfast*

The idea for the project came from a lesson on the Chinese Tangram – an old puzzle involving seven shapes in a square. As the children were cutting up their gummed paper and trying to remake the square and then other picture shapes, it suddenly dawned that this would be a puzzle ideally suited to the programming language Logo.

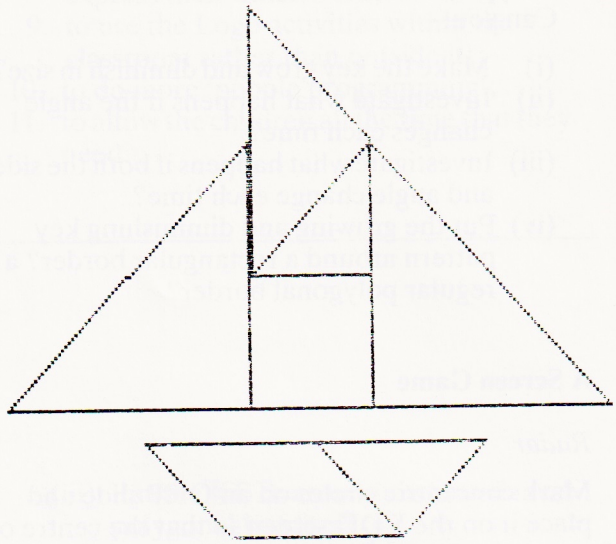
The first problem to solve was to draw the tangram itself. We could all draw the square, but what was the length of that diagonal? This was to be the start of finding out that there are different ways to solve problems. Trial and error on this occasion was the most popular.



Having now found the sizes of the shapes and their relationship to each other, these became the basic building blocks from which the tangram pictures were to be drawn. Each of the ten graphs would need to have five procedures as the starting off point – three different sizes of triangle, the square and parallelogram. Because the diagonal turned out to be 500 we ended up with very precise figures:

```
TO SQUARE
REPEAT 4 [FD 212.5 RT 90]
END
```

These basic shapes were not too difficult to draw – each of the triangles was right angled and bore a relationship to all the other shapes. The problem now was how to organize these shapes



on the screen to end up with the picture chosen by the group.

After much discussion and procedure writing, one group discovered it was much easier, if the basic procedures, ie. the three triangles, square and parallelogram, were drawn from the same starting point. In the case of the triangles this would obviously be the right angle. As this was explained, other groups realized that here was an answer to all that turning of the shape in the picture. Just move to the position of the right angle, and then place your building block.

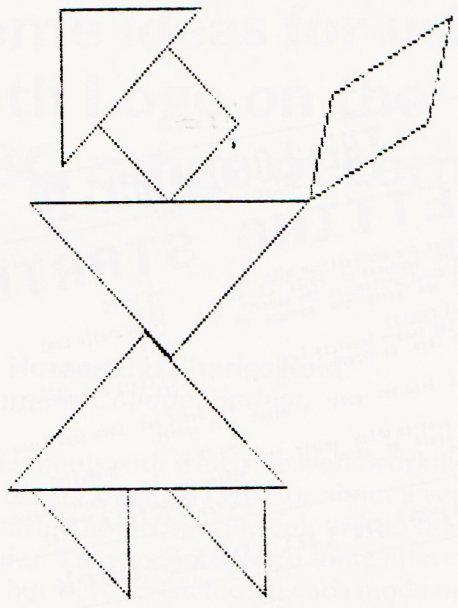
Procedures now began to take on a new structure:

```
TO PICTURE
MOVE 1
TRI 3
MOVE 2
TRI 2   etc.
```

This was certainly much neater and, as we had found to our cost, a whole lot easier to manage and to see where the faults lay.

As the pictures began to develop, there was tremendous excitement and, for a change, the problem-solving situation in the class was meaningful and related. 'How do I tidy this up, so that it's in the centre?' Some lessons on position and the Logo primitive SETPOS followed.

I lost some of my own prejudices on this one! Negative cartesian coordinates in a primary school? Not for me – but they did need it and in a few days I'd been convinced as SETPOS [-300 -300] became part of the scene.



Another problem of scaling arose. The original tangram filled the screen, but the measurements were too large to put many of the pictures on the screen. Again more meaningful maths activity resulted in new sizes of building block.

To keep everyone informed, we decided to produce a newsheet. The *Logo Look-In*. This included tips and procedures other groups had found useful. For ease of use, *Front Page* was chosen.

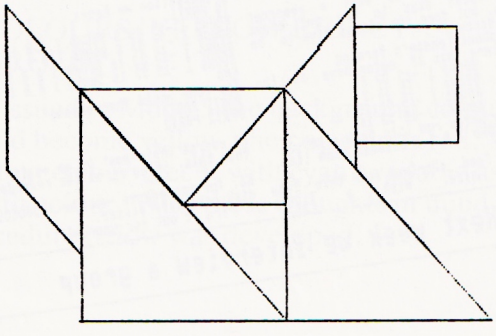
One procedure I found in the *Starlogo* magazine and passed on to the *Logo Look-In* was particularly useful. It tidied up the screen by removing the prompt and flashing line. This made a professional looking screen of picture and comment.

```
TO TIDY
VDU [23 0 10 32 "0 "0 "0]
VDU [23 8202 "0 "0 "0]
END
```

Each group was now familiar with the basic structure of Logo and could use and change procedures with confidence. Many however were asking for big improvements.

Can I make a barking noise for my dog picture? or

Could he wag his tail?



This was where the extensive nature of Logo proved invaluable. With simply a turtle graphics package, this would have signalled the end of the project, but now we were just getting our 'second wind'.

Three main areas of sophistication were being asked about: making sounds, using colour, and some idea of animation. Each group went their separate ways on these . . . only one worked on a tune to accompany the tangram picture, and one group succeeded in making movement – the tail of the dog began to wag. Using the PE command and then redrawing in a different position worked extremely well.

Most groups opted for colour and the excellent FILL command. The improvement was so great that most groups decided on a before and after page to show how much they had improved during the term.

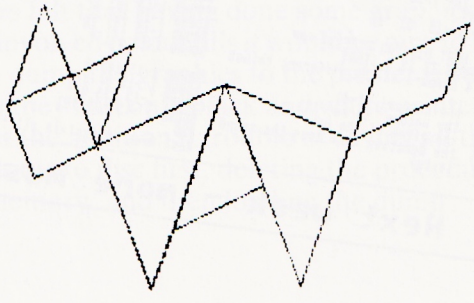
One group who had finished their screens designed a title page and asked if we could put all our screens together to cycle one after another. . . . They had seen some pages from another class produced on *Telebook*!

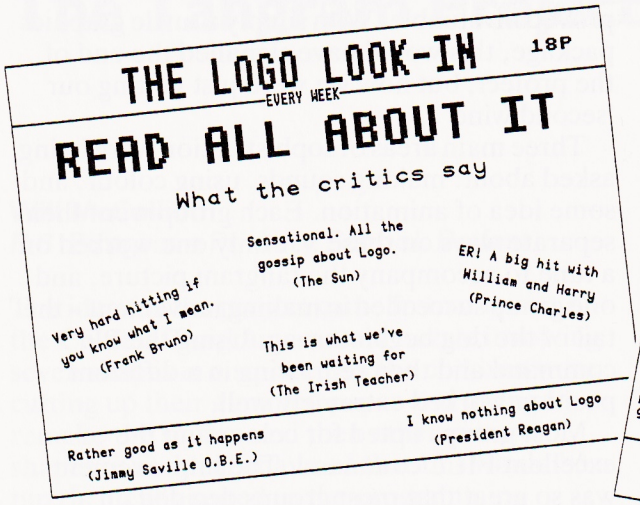
The result was that every class in the school was able to see what was essentially a term's work and many parents were fascinated as it cycled round on school concert night.

On reflection, I was amazed to find how much mathematics we had covered. Basic skills had been applied in new contexts, numerous activities including problem solving had arisen and topics such as angles, scaling and position were given new meaning. On top of this, the social skills of cooperation and communication had developed as a result of our discussion and group work. Instead of one group copying, there had been a great ideas swap. Groups were genuinely interested in each other's work, and the brighter children had found areas in Logo to keep them 'stretched'.

From a teacher's perspective I was very pleased that a number of parents bought their children Logo for their home computers due to demands. (Anything for a quiet life!)

At the end of the term, I asked the class if they would all groan if we did another Logo project next term. 'Oh no! We want to work all those switches and things,' they said. Some had seen a TV programme using *Control*. Here we go again!





THE LOGO LOOK-IN 18P

EVERY WEEK

# READ ALL ABOUT IT

What the critics say

Very hard hitting if you know what I mean.
(Frank Bruno)

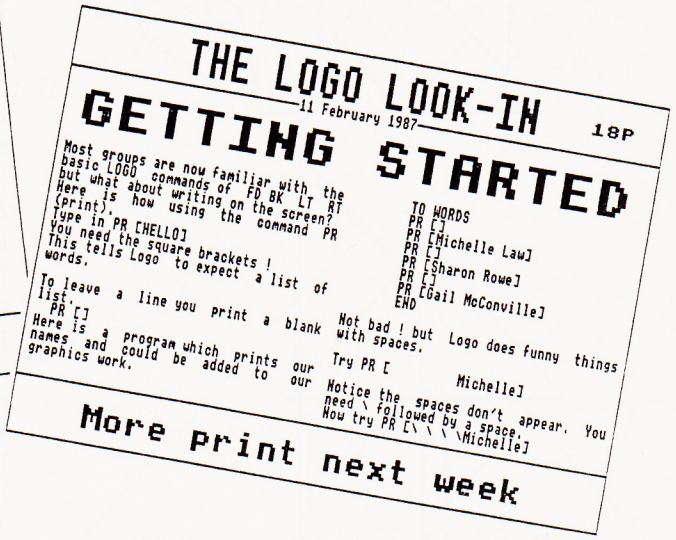
Sensational. All the gossip about Logo.
(The Sun)

This is what we've been waiting for
(The Irish Teacher)

ER! A big hit with William and Harry
(Prince Charles)

Rather good as it happens
(Jimmy Saville O.B.E.)

I know nothing about Logo
(President Reagan)



THE LOGO LOOK-IN 18P

11 February 1987

# GETTING STARTED

Most groups are now familiar with the basic LOGO commands of FD BK LT RT but what about writing on the screen? Here is how using the command PR (print).
Type in PR [HELLO]
You need the square brackets ! This tells Logo to expect a list of words.

To leave a line you print a blank list.
PR []

Here is a program which prints our names and could be added to our graphics work.

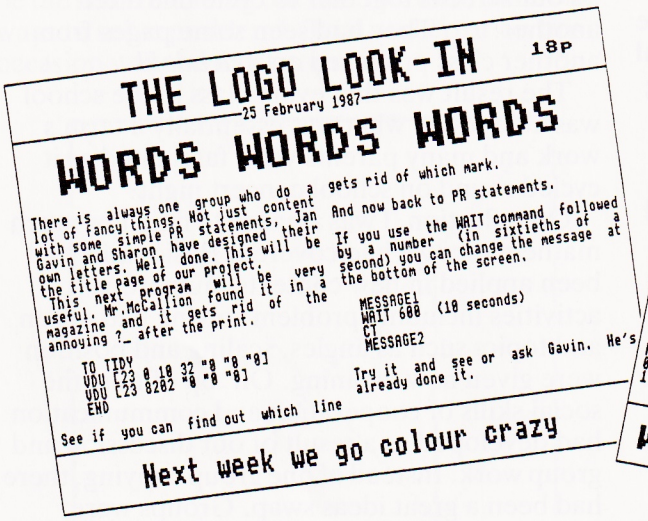
```
TO WORDS
PR []
PR [Michelle Law]
PR []
PR [Sharon Rowe]
PR []
PR [Gail McConville]
END
```

Not bad ! but Logo does funny things with spaces.

Try PR [ Michelle]

Notice the spaces don't appear. You need \ followed by a space.
Now try PR [\ \ \Michelle]

More print next week



THE LOGO LOOK-IN 18P

25 February 1987

# WORDS WORDS WORDS

There is always one group who do a lot of fancy things. Not just content with some simple PR statements, Jan Gavin and Sharon have designed their own letters. Well done. This will be the title page of our project.
This next program will be very useful. Mr.McCallion found it in a magazine and it gets rid of the annoying ?_ after the print.

```
TO TIDY
VDU [23 0 10 32 "0 "0 "0]
VDU [23 8202 "0 "0 "0]
END
```

See if you can find out which line gets rid of which mark.

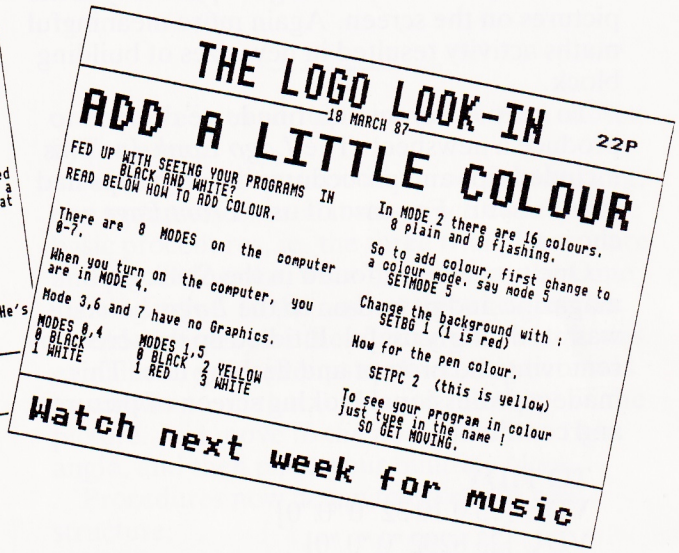
And now back to PR statements.

If you use the WAIT command followed by a number (in sixtieths of a second) you can change the message at the bottom of the screen.

```
MESSAGE1
WAIT 600  (10 seconds)
CT
MESSAGE2
```

Try it and see or ask Gavin. He's already done it.

Next week we go colour crazy



THE LOGO LOOK-IN 22P

18 MARCH 87

# ADD A LITTLE COLOUR

FED UP WITH SEEING YOUR PROGRAMS IN BLACK AND WHITE?
READ BELOW HOW TO ADD COLOUR.

There are 8 MODES on the computer 0-7.

When you turn on the computer, you are in MODE 4.

Mode 3,6 and 7 have no Graphics.

MODES 0,4
0 BLACK
1 WHITE

MODES 1,5
0 BLACK 2 YELLOW
1 RED 3 WHITE

In MODE 2 there are 16 colours. 8 plain and 8 flashing.

So to add colour, first change to a colour mode. say mode 5
SETMODE 5

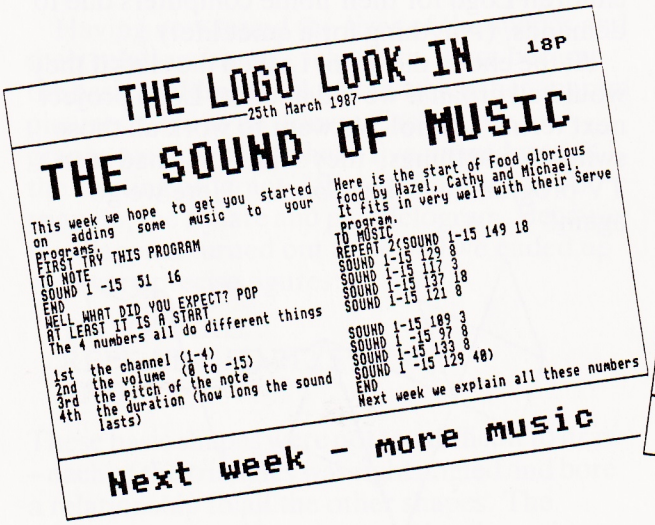
Change the background with :
SETBG 1 (1 is red)

Now for the pen colour.

SETPC 2 (this is yellow)

To see your program in colour just type in the name !
SO GET MOVING.

Watch next week for music



THE LOGO LOOK-IN 18P

25th March 1987

# THE SOUND OF MUSIC

This week we hope to get you started on adding some music to your programs.

```
FIRST TRY THIS PROGRAM
TO NOTE
SOUND 1 -15  51  16
END
WELL WHAT DID YOU EXPECT? POP
AT LEAST IT IS A START
```

The 4 numbers all do different things

1st the channel (1-4)
2nd the volume (0 to -15)
3rd the pitch of the note
4th the duration (how long the sound lasts)

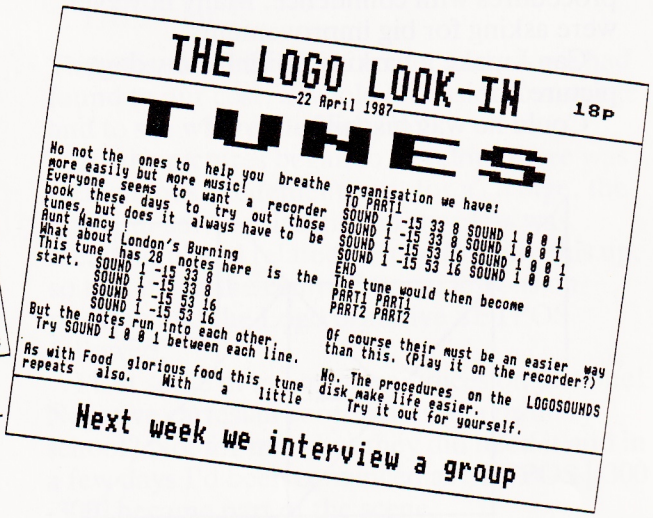
Here is the start of Food glorious food by Hazel, Cathy and Michael. It fits in very well with their Serve program.

```
TO MUSIC
REPEAT 2[SOUND 1-15 149 18
SOUND 1-15 129 8
SOUND 1-15 117 3
SOUND 1-15 137 18
SOUND 1-15 121 8
SOUND 1-15 121 8

SOUND 1-15 109 3
SOUND 1 -15 97 8
SOUND 1-15 133 8
SOUND 1 -15 129 40]
END
```

Next week we explain all these numbers

Next week - more music



THE LOGO LOOK-IN 18P

22 April 1987

# TUNES

No not the ones to help you breathe more easily but more music!
Everyone seems to want a recorder book these days to try out those tunes, but does it always have to be Aunt Nancy !
What about London's Burning
This tune has 28 notes here is the start.

```
SOUND 1 -15 33 8
SOUND 1 -15 33 8
SOUND 1 -15 53 16
SOUND 1 -15 53 16
```

But the notes run into each other. Try SOUND 1 0 0 1 between each line.

As with Food glorious food this tune repeats also. With a little organisation we have:

```
TO PART1
SOUND 1 -15 33 8 SOUND 1 0 0 1
SOUND 1 -15 53 8 SOUND 1 0 0 1
SOUND 1 -15 53 16 SOUND 1 0 0 1
END
```

The tune would then become

```
PART1 PART1
PART2 PART2
```

Of course their must be an easier way than this. (Play it on the recorder?)

No. The procedures on the LOGOSOUNDS disk make life easier.
Try it out for yourself.

Next week we interview a group

# Some ideas for using colour with Logo on the BBC range of computers

**Gray Horner** and **Charles Reid**
*Stranmillis College, Belfast*

Some schools with which we were working had been using Logotron Logo for about a year and had started to incorporate colour into their graphics. They had produced some interesting work but were restricted, in each mode of the BBC computer, to the default selection of colours which Logo allowed them when it is first activated. The teachers realised that there was a palette of colours available from which a personal choice could be made. Thus, in Mode 4, any choice of two out of eight (not counting flashing colours), in Mode 5 any choice of 4 out of 8,and in Mode 2 all eight were available. To select a personal choice of colours from the palette required a knowledge of the VDU commands on the BBC, something the teachers felt they did not wish to get involved in either for themselves or with their pupils. It was decided that the best solution would be to provide a 'toolkit' procedure which could be loaded before the children started their work and which would be designed to make it easy both for the teachers and the children to use. With this in mind it was decided that colours could be selected by name rather than by using a colour 'number'. Logo is designed in such a way that it uses colour 0 for the background colour, colour 1 for the pen colour, and colours 1, 3, or 7 for the text colour in Modes 4, 5 and 2 respectively unless, of course, the user changes either of the first two by using the SETPC and SETBG commands. The procedure was designed so that the first colour in the parameter list would become the background colour, the second the pen colour, and the last named one the text colour. Thus if the command:

```
COLOURS [YELLOW RED CYAN
GREEN]
```

was issued in Mode 5 the background colour would become yellow, the pen colour red, and the text colour green, with cyan available as a fourth colour. With these thoughts in mind the procedure below was developed.

```
TO COLOURS :N
MAKE "BLACK 0
MAKE "RED 1
MAKE "GREEN 2
MAKE "YELLOW 3
MAKE "BLUE 4
MAKE "MAGENTA 5
MAKE "CYAN 6
MAKE "WHITE 7
MAKE "LC 0
MAKE "K 1
REPEAT COUNT :N [MAKE "A THING
ITEM :K :N MAKE "V ( SE 19 :LC :A 0 0 0 )
VDU :V MAKE "K :K + 1 MAKE "LC :LC
+ 1]
END
```

The procedure is used by typing the colours as a list in square brackets, as shown above, following the procedure name. As a further example COLOURS [BLUE YELLOW] used while in Mode 4 would change the selection of colours to blue and yellow with blue as the background colour, yellow as the pen colour, and text in yellow. Although the full palette is available in Mode 2 the procedure can still be used as a useful way of changing the background, pen, and text colours in one step. Finally it is important to use the appropriate number of parameters in each mode otherwise the results, while predictable, will not be as described above.

A further problem which the teachers had, arose from the use of two of the additional primitives, namely SCREENDUMP (now FASTDUMP and SLOWDUMP in the latest versions) and FILL, available on the Logo extension disc. The problem here is that it is not possible to have these both present in memory at the same time and Logotron could offer no solution. The teachers felt that having done some graphics which involved colour fills it would be nice to be able to dump the graphics to the printer (even though they had only black and white printers) without the additional trouble of saving all their procedures to disc first, deleting the procedures from memory, and then loading the dump

procedure. For users of the BBC the only solution was to have a separate dump program on disc or rom which could be called up from within Logo using a '*' command. For those fortunate enough to have a Master or Master Compact however there was an easier solution. The operating system of the Master series has a number of additional graphics facilities which include routines for doing colour fills and for circles and ellipses. Those once again are accessed through VDU commands and so another 'toolkit' procedure was developed. This one was much easier and is given below.

```
TO FILL
HT
VDU [25 129 0 0 0 0]
ST
END
```

To use this the turtle should be moved inside the bounded area to be filled. Now when the FILL command is issued the area will flood fill with the current pen colour. Thus it works in exactly the same way as the fill on the Logo extension disc. As an example the procedure below should draw a filled square of variable size.

```
TO SQUARE :SIDE
REPEAT 4 [FD :SIDE RT 90]
PU RT 45 FD :SIDE/4 PD
FILL
END
```

Ellipses are difficult if not impossible for many people to draw by conventional means in Logo, and yet children might very well want to incorporate them into their pictures, e.g. to represent an egg. The following procedures therefore were also added to the 'toolkit'.

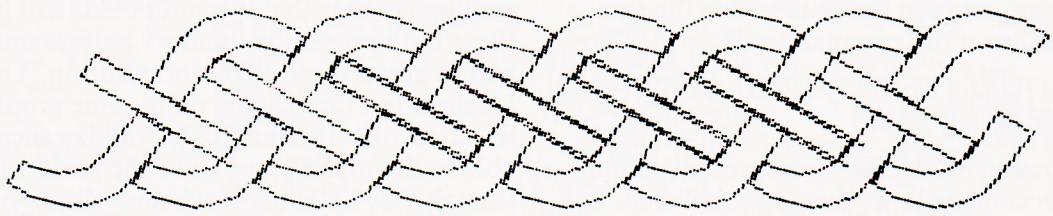
```
TO ELLIPSE :Maj :Min :Type
HT PU
MAKE "Ang 90 - HEADING
MAKE "C COS :Ang
MAKE "S SIN :Ang
MAKE "Yv SQRT ( ( SQ :Min * :C ) + ( SQ
:Maj * :S ) )
MAKE "Xv ( ( SQ :Maj ) - ( SQ :Min ) ) * :C
 * :S / :Yv
MAKE "Xi :Maj * :Min / :Yv
MAKE "OldX XCOR
MAKE "OldY YCOR
SETPOS SE :OldX :OldY
SETPOS SE :OldX + :Xi :OldY
IF :Type = 0 [MAKE "P1 197] [MAKE "P1
205]
MAKE "NewX ( INT :OldX + :Xv )
MAKE "NewY ( INT :OldY + :Yv )
VDU ( SE 25 :P1 Bytes :NewX Bytes :NewY )
SETPOS SE :OldX :OldY
ST PD
END

TO SQ :X
OP :X * :X
END

TO Bytes :N
MAKE "B1 :N - 256 *INT ( :N / 256 )
MAKE "Bh INT ( :N / 256 )
OP SE :B1 :Bh
END
```

The ellipse procedure is used by typing ELLIPSE followed by three parameters. The first is the length of the semi-major axis, the second the length of the semi-minor axis and the third is either 0 (for an outline ellipse) or 1 (for a filled ellipse in the current pen colour). The ellipse can be drawn in any orientation by first making the turtle point along the direction which is to be that of the major axis.

**N.B.** This ellipse program will only work on a Master or a BBC with a graphics extension ROM.



LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...

# Looking at language

LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...

## Talking computer

Type HELLO and press <RETURN>

You will see this message:

I DON'T KNOW HOW TO HELLO

We can teach it how to respond!
Type in the following procedure:

```
TO HELLO
PRINT [HELLO]
PRINT [I AM A TALKING COMPUTER1]
PRINT [WHO ARE YOU?]
PRINT [ ]
END
```

Now type in HELLO

What happened? Did you tell it your name?
How did it respond?
Can you:–

(i) Type in a procedure so that the computer can respond to your name?
(ii) Type in a procedure so that the computer can respond to your friend's name?
(iii) Make the computer ask about your health?
(iv) Get the computer to respond to your answers?

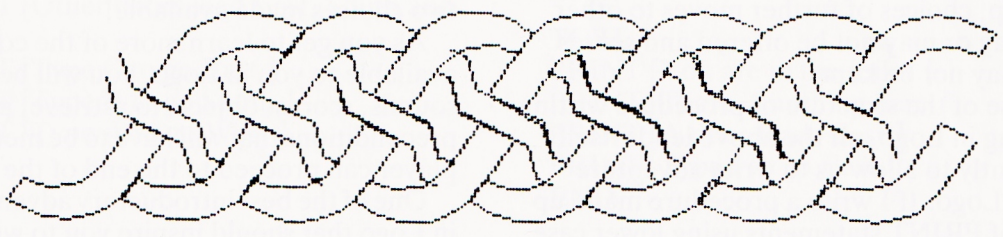
*Hints*
PR can be used as a quick way of writing PRINT.
CT means Clear the Text screen. You may want to do this between your answers and the computer's response.

If you use CT, it might be useful to have a delay which leaves the text on the screen long enough for you to read it. This can be done by using WAIT 60 which will cause the computer to wait for one second before it clears the screen. The number you use with WAIT can be made bigger or smaller to change the length of time the computer waits.

Try typing in the following procedure:

```
TO TALK
CT
REPEAT 5 [PR [ ] ]
PR [Oh my poor keyboard!]
PR [People will keep hitting my keys too
hard.]
PR [I don't know what to do]
WAIT 400
CT
PR [Should I BLANK the screen? or LOCK
the keyboard?]
END
```

Continue this conversation by writing procedures for BLANK, LOCK, etc.



# A Quiz

Try typing in the following procedure.

```
TO QUIZ
PRINT [Who is the lead singer of U2?]
PRINT [Is it BONO, EDGE or LAP?]
PRINT [ ]
PRINT [Type BONO EDGE or LAP]
END

TO BONO
PRINT [Well done! Now try this!]
PRINT [ ]
QUESTION2
END

TO EDGE
PRINT [Sorry! You will have to try again!]
PRINT [ ]
QUIZ
END
```

Can you:–

(i) Write a similar procedure for LAP?
(ii) Write a new set of procedures for QUESTION2? Add more questions?
(iii) Clear the screen before each question is asked? Is this a good idea?
(iv) Write different quizzes for Pop music, TV programmes, films, etc?

*Hints*
You can devise a scoring system using:

```
MAKE "SCORE :SCORE + 1
```

if the user gets an answer right, like this:

```
TO BONO
PRINT [Well done! Now try this!]
PRINT [ ]
MAKE "SCORE :SCORE + 1
QUESTION2
END
```

Can you work out where to use:

```
MAKE "SCORE :SCORE – 1
```

if they get the answer wrong? Is this a fair way of keeping score? Can you improve it?

# Why Write Adventure Games in Logo?

The majority of people using Logo are probably very familiar with all sorts of claims for mathematical benefits that occur through the use of turtle graphics. These benefits would also include the involvement of discussion skills and an improvement in the level of use of mathematical language.

Another way of developing language skills is to use Logo to write and play adventure games. The essential features of adventure games are that scenes are described, things may or may not happen, objects may or may not be present for picking up, choices of further moves to other scenes may or may not be offered and scores may or may not be kept.

Because of the structure of procedure writing and calling in Logo, all the above lends itself conveniently to allow us to write adventure games in Logo. If I write a procedure made up entirely of PRINT statements using lower case letters but offering the player a choice of next move based on words written in capital letters, all she has to do is type the name chosen, which will itself be another procedure name, and she will proceed through the adventure.

For example:

```
TO GO
PR [You are in a dark cave, with only a failing
torch]
PR [to provide light. There appear to be only two]
PR [exits, one of which smells of perfume, the]
PR [other of diesel fumes. Which way will you
choose?]
PR [Type PERFUME or DIESEL]
END
```

You are now left with designing scenarios for the two choices made available!

As you get to learn more of the commands available to you in Logo, you will begin to add sounds, scores, objects to retrieve, pauses and preconditions that will have to be met before the player can proceed to the end of the game.

One of the best introductory adventure games in Logo that should inspire you to write your own is *Ogre* by Chris Robinson, which appeared in *Turtle Tracks*, an ideas supplement published by the British Logo User Group.

# Ogre:– creating an adventure game

This should work on any machine that uses LCSI Logo – though you may have to use SE instead of SENTENCE and MEMBER? instead of MEMBERP.

```
TO START
TS
MAKE "bag [sandwiches]
HELP
PRINT "
B
END

TO HELP
PRINT [You are in the Ogre's house.]
PRINT [The main door has slammed shut and
you cannot get out!]
PRINT [You must escape without being
caught.]
PRINT [You are carrying a bag.]
PRINT [To see what's in it, type BAG]
END

TO BAG
PRINT SENTENCE [You are carrying] :bag
END

TO A
PRINT [You are in the kitchen.]
PRINT [You can see a sink and a stove.]
PRINT [Doors lead East and South.]
WAIT 100
PRINT [Suddenly the Ogre jumps out from
behind the door.]
PRINT [You have been captured.]
PRINT [GAME OVER]
END

TO B
PRINT [You are in the Entrance Hall.]
PRINT [The main door won't open.]
PRINT [Other doors lead East, South and
West.]
PRINT [Type C to go East.]
PRINT [Type E to go South.]
PRINT [Type A to go West.]
END

TO C
PRINT [You are in the lounge.]
PRINT [A door leads West.]
PRINT [Type B to go West.]
END

TO D
PRINT [You are in the Dining Room.]
PRINT [You see the Ogre's half-finished
dinner.]
PRINT [The Ogre must be near.]
PRINT [Doors lead North, East and South.]
PRINT [Type A to go North.]
PRINT [Type E to go East.]
PRINT [Type G to go South.]
END

TO E
PRINT [You are in the Main Hall.]
PRINT [Doors lead North, East and West.]
PRINT [Type B to go North.]
PRINT [Type F to go East.]
PRINT [Type D to go West.]
END

TO F
PRINT [You are in the Ogre's bedroom.]
PRINT [The bed is empty and cold.]
PRINT [The Ogre is not near.]
PRINT [Doors lead West and South.]
PRINT [Type E to go West.]
PRINT [Type I to go South.]
END

TO G
PRINT [You are in the study.]
PRINT [You see a coil of rope on the desk.]
PRINT [A door leads North.]
PRINT [Type J to take the rope.]
PRINT [Type D to go North.]
END

TO H
PRINT [You are in the toilet.]
PRINT [There is nothing here.]
PRINT [A door leads East.]
PRINT [Type I to go East.]
END
```

# An Adventure in Logo

**Peter Hibbs**
*St Benedict's RC School, Cheltenham*
**Veronica Ward**
*Teacher, St Gregory's RC School, Cheltenham*

I much enjoyed the two days that I spent in St Andrew's Primary School, Cheltenham as part of a 20 day DES Logo course. Thus I formulated the idea of using some of the spare time, post CSE/GCE, that secondary school teachers have, to introduce adventure game writing in Logo at one of our primary feeder schools, St Gregory's. I could spend Thursday afternoons at St Gregory's during the latter half of the summer term. Bearing in mind the tight time constraints, I asked for a J4 class, deeming it necessary to have an older class in order to have a real chance of completing the project.

The aims of the project were discussed with Mrs Veronica Ward, the class teacher. She had no previous Logo experience.

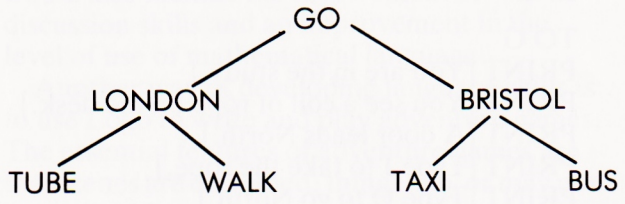
The class had been using an adventure game as part of their general classwork. They discussed this with Mrs Ward prior to the commencement of the project. Therefore they had formed some ideas of strategy and the decision making involved.

By keeping the necessary 'tools' to a minimum we aimed to involve the children as rapidly as possible.

They were given:–

(i) A brief introduction and shown only the START of an adventure game which had been written by four of the teachers on the DES Logo course.

(ii) Shown a branching plan:




(iii) Shown how to use PR, WAIT, REPEAT [PR []], TS CT and how to use the Editor. Additional primitives were added when the need arose.

The class was expressly not shown the game in full for fear that this may have robbed them of their originality.

Events proceeded even better than we had hoped. Ten games were in production, all entirely their own ideas. Mrs Ward feels confident that she could 'go it alone' (well, almost!) next year.

Many positive aspects have emerged:–

(i) Ideas and discoveries have been passed around the groups. (These related to sound, and a rather cumbersome method of printing a title letter by letter using SETCURSOR.)

(ii) Most of the class can update their files and backup unaided.

(iii) Excellent 'advertising posters' were being produced.

(iv) One Tuesday the class were with a supply teacher. They were coping very nicely without Mrs Ward or myself.

(v) Above all, we have all enjoyed ourselves, and the children have readily adapted to their microworlds in the most approved Papert fashion.

The games all use Mode 7 on BBC Bs. Although lack of memory is a problem, we did not wish to involve ourselves in reading in different files from disc unless absolutely necessary. At the time of writing the groups are in the process of adding colour to procedures and 'highlights' to the 'key words'. This is accomplished by using two simple procedures that I have supplied them with to replace PR and TYPE. This has meant a fair amount of re-editing and perhaps this should have been considered from the outset.

Each group also has a member working on large teletext letters. These will have to be held as separate files because of memory restraints. These letters have been designed on squared paper and the participants were warned that the coding would be rather tedious.

An auto-boot feature has been added (with liberal use of colour). The files are loaded from a menu and VDU [21] is used to prevent the procedure names being displayed.

At various times we have tried to introduce a new idea, colour . . . sound . . . teletext graphics. From time to time the children wished to do things which were rather too ambitious in the programming sense, bearing in mind the time limit. This had been foreseen and we did tell them that this would probably occur.

My only real problem is . . . what will I do with them when they come to me at the secondary school next year? On the other hand I shall have a group of helpers for those poor unfortunates who arrive Logo-less!

**N.B.** The class has one computer of its own; my school was able to lend two and sometimes three other systems for extended periods.

LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...

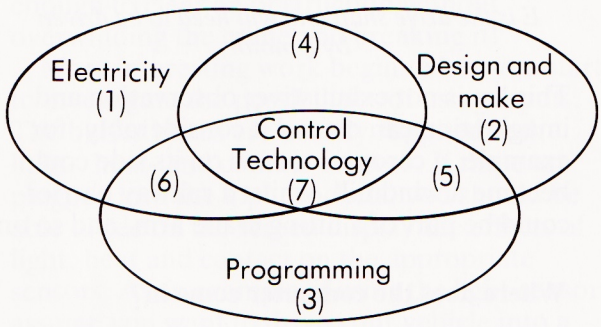
# Control

LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...

## What is Control Technology?

**Reg Eyre**

In the context of what we can do in the primary classroom, control technology is the coming together of various activities which are already occuring. These activities include working with simple electrical circuits, design-and-make tasks, problem-solving and programming. The following diagram is an attempt to put these activities into context.




The areas in the diagram, [1],[2], etc, may be linked to particular classroom activities or curriculum content, for example:

[1] Ideas about electrical circuits developed through investigations and problem-solving activities, using batteries, wires, lamps, buzzers, motors and switches. Other aspects could include safety, (non-use of mains), conductors and insulators.

[2] Using construction kits, for example, Lego, Robotix, etc; using tools with standardised materials, that is, the BST approach; junk modelling to encourage creative use of materials; joining materials using a variety of methods, such as mechanical (nails, screws), and chemical (PVA, hot glue), and associated safety aspects.

[3] The two languages most used in schools are Logo and BASIC. Of these, Logo offers children the easier entry into programming; building procedures, using time delays and conditional statements.

[4] Making working models which use simple circuits, for example, buggies and fairground rides; building switches from everyday materials and linking them with working models.

[5] Building mechanical devices that do something, for example, time 10 seconds, or act differently according to the conditions, for example, sorting different sized balls or coins.

[6] Using *Controller, Javelin,* or *Contact* to write programs to switch the output display on and off; experimenting with motors, lamps, buzzers and sensors.

[7] Control technology can be seen as practical problem-solving, bringing together the areas of electricity, programming and design-and-make.

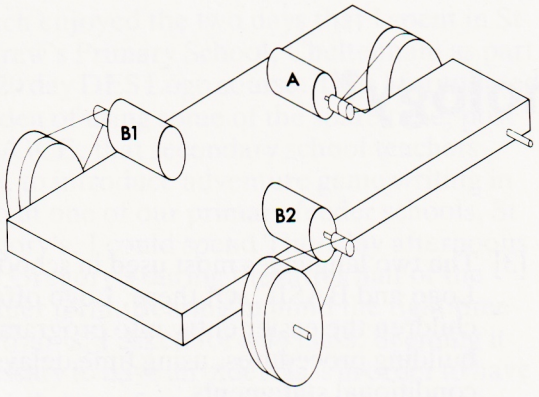
### How do I get started?

There are many ways of building models which are powered by motors, or which somehow use lights or buzzers. For some, Lego Technic is a good introduction to model-making. For others, Robotix, Fischer-Technic, Meccano, or even junk, will have advantages. The important feature is that the children can make something which functions reliably, and does what it is supposed to do. Appearance can be deceptive, since it will have to be related to the children's imagination!

**What sort of models can be built using motors?**

The main types are:

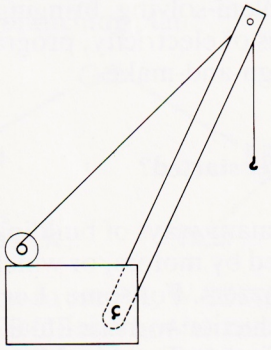
i) a buggy powered by one or two motors – these will involve experimenting with different types of drive, gearing, placing of motors and steering.




*Possible positions for small electric motors*
*A - for single drive, no steering*
*B1 and B2 - possibilty for steering*

ii) a crane – this could involve consideration of such problems as automatic stopping when the cable is fully up or down, counterbalancing if the crane is of the building-site type, and the design of the hook or attachment mechanism, bearing in mind what has to be lifted, and whether or not the lifting arm is to move.

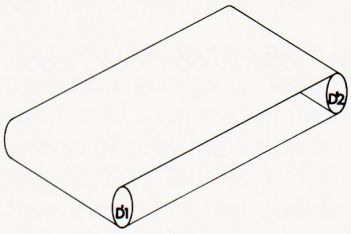
*Possible to pivot arm at C*
*Why might you want to do this?*




*Crane with fixed arm*

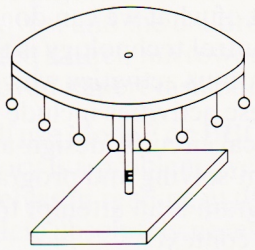
iii) a conveyor belt – design problems which might occur include the placing of the drive motor and the properties of the belt itself, degree of slack, width, and so on. Remember that a conveyor belt mechanism can be turned upside-down to give a tractor drive vehicle!

*D1 and D2 are rollers, one of which must be driven by a motor*




*Corrugated card makes a good conveyor belt*

iv) a fairground carousel – typical problems will include gearing, counterbalancing, and positioning of the motor.




*E is the drive shaft and will need to be driven by a motor*

This list is not exhaustive; observation and imagination can extend it considerably, for example, a carousel turned on its side could become a windmill, whilst a railway barrier could be part of a lifting crane arm, and so on.

**Where does the computer come in?**

The connection of such models to the computer, and the programming of the control of the models is only an extension to the craft, design and build part of the exercise. The two essentials necessary are a buffer box which will have connections for inputs and outputs, sometimes referred to as a control box, of various prices, from about £50 upwards. The Logo extension software is free!

Controlling the childrens' models involves replacing the 4.5 volt battery they used to test the models with connections to the output side of the buffer box and using the computer as a £400 switch!

If you use Logotron or LSL Logo, you can obtain *Controller* from your LEA adviser, or if you have not got a Logo chip yet, you can get a copy of *Javelin*, (or better still *Contact*), from the adviser. These last two are the equivalent relationship of *Dart* to Logo for turtle graphics.

You will now have some new commands to try such as SWITCHON, SWITCHOFF and WAIT. The simplest program to write will be a lighthouse.

in Logo:

```
TO LIGHT
SWITCHON 1
WAIT 60
SWITCHOFF 1
WAIT 90
LIGHT
END
```

or using *Contact*:

```
BUILD LIGHT
SWITCHON 1
WAIT 60
SWITCHOFF 1
WAIT 90
LIGHT
escape
```

**Is this all there is to control technology?**

The first stages are about switching things on and off with appropriate time delays as in traffic lights, making your buggy move exactly one metre or using the crane to lift the cargo high enough to clear an obstruction without overwinding the crane and breaking it!

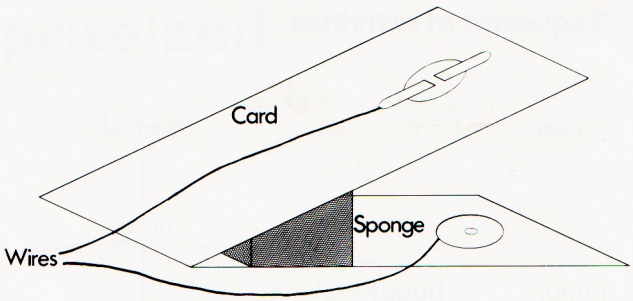
More interesting work begins when you start to investigate the possibilities of using inputs. The buffer boxes are usually supplied with light-, heat- and contact-sensors. If these are plugged into the input sockets, you should be able to see on the screen display the effects of light, heat and contact on the appropriate sensors. As an example of using the light-sensor, assume you want to drive your vehicle into a garage and automatically stop, then use the light-sensor to detect the dark as in the following program:

```
TO AUTOSTOP
SWITCHON 4
IF INPUTON? 1 [AUTOSTOP] [SWITCHOFF 4]
END
```

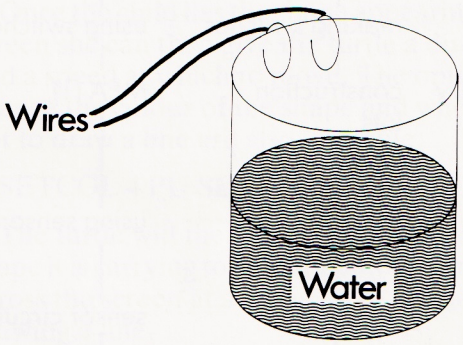
(This says 'if light is falling on the sensor, then keep going; otherwise switch off the motor because the vehicle must be in the dark garage').

**Can we make our own input switches?**

Children can make their own contact switches with just two wires to form, for example a pressure pad or a water-contact-switch.




*Pressure switch*




*Water level switch*

**Will my class be able to extend this work in the secondary school?**

One of the other input devices which can be used is attached to the Adval port on the back of the computer. Instead of giving an on or off using the inputs as a buffer box, it gives a number which represents the amount of light or heat reaching the sensor. Using this, we might be able to discriminate between colours by measuring the amount of light reflected, for example:

```
IF MEASURE? > 150 [PRINT [THIS IS
BLUE]]
```

**Other questions asked by teachers**

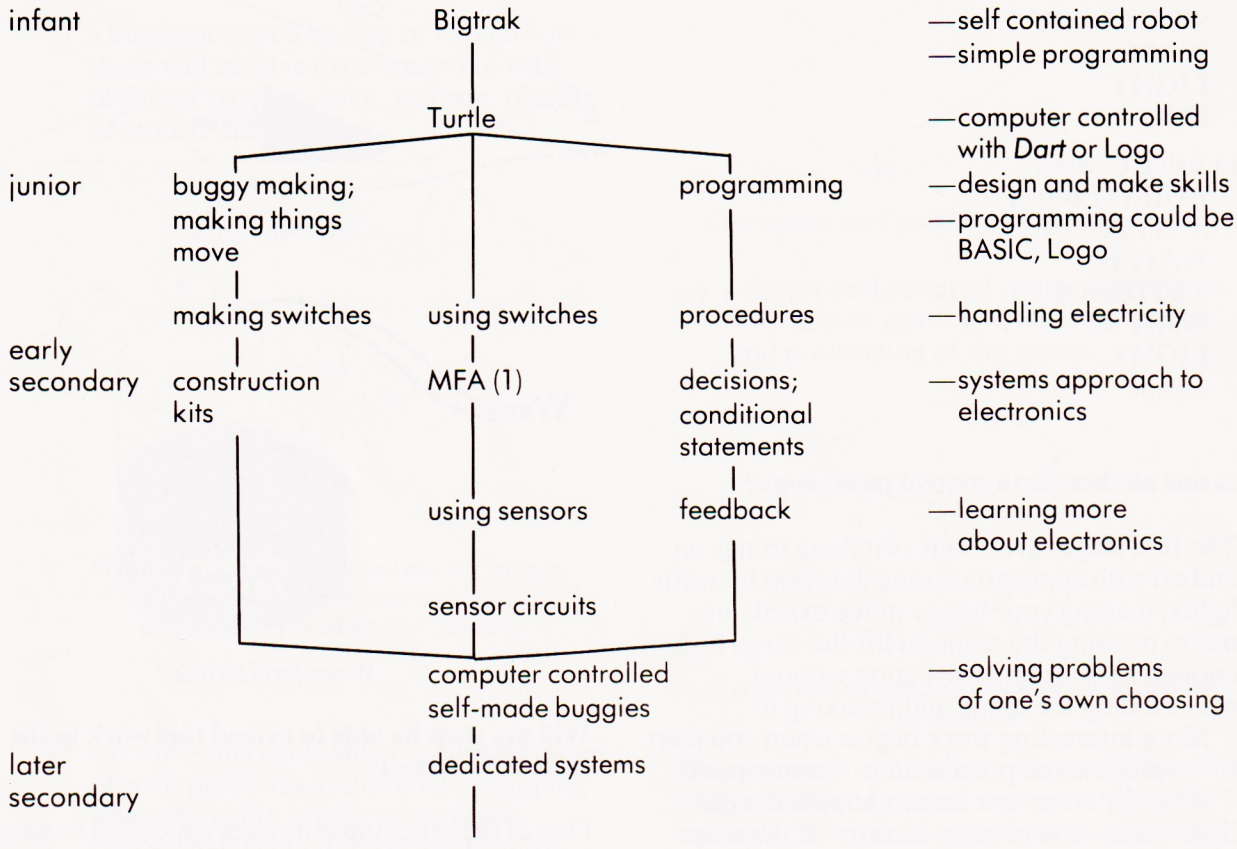
What is the progression in the classroom?

Does Control Technology at the primary stage take away later experiences and glamour in the secondary school?

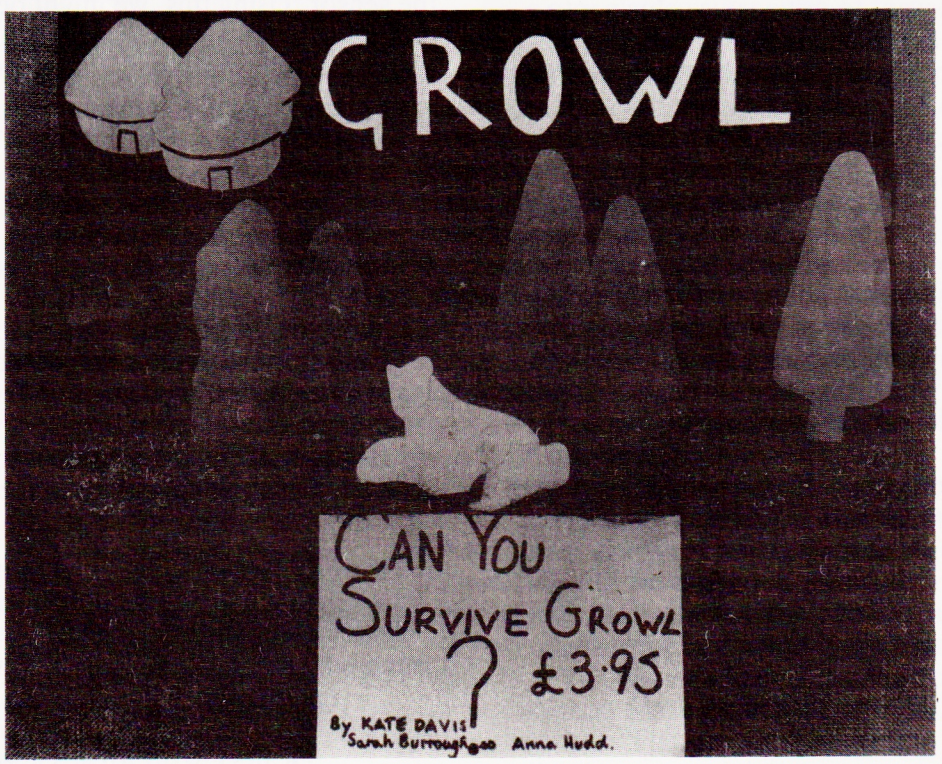
How do secondary school teachers feel about these activities taking place in the primary school?

These are difficult questions to answer since there is very much of an educational free for all. The following diagram shows how a progression might develop:

**Sequence of activities**




(1) *MFA – microelectronics for all (MEP), an introduction to control using logic gates, counter and limited memory.*




*A poster advertising a Logo adventure (see Peter Hibbs' article).*

# Logo Adventures in Spriteland

**Janice Staines**
*MESU*

A new excitement seems to enter the classroom with the addition of sprites. Children already used to driving a turtle through Logo commands, suddenly find that they can ask the turtles to carry different shapes *and* give them a direction and a speed. This opens up a whole new world to them in terms of creating their own animated 'microworlds' - a world limited only by the child's imagination.

Many Logos have sprites as an integral part of them (Atari Logo for the 400 and 800 series, Nimbus Logo, Texas Instruments Logo . . .) but others, like the BBC, need the additional purchase of a Sprite board. These are by no means cheap to buy. Having scrimped and saved or nagged your I.T. adviser to provide you with a Logotron Logo chip, you are then faced with another large bill if you want to get into Sprites! But, it is well worth the expense.

New shapes can be created easily by the child. They are usually presented with a grid and then the squares can be either filled or emptied by pressing the space bar. They can move around the grid and select the square to be filled using the direction arrow keys.

Once the shape has been created the child can direct the turtle to carry the shape by typing.

```
TELL 0 SETSH 12 ST
```

Where 0 is the number of the turtle the child is currently addressing, SETSH is short for set shape and 12 is the number of the shape the child has built. ST is short for show turtle.

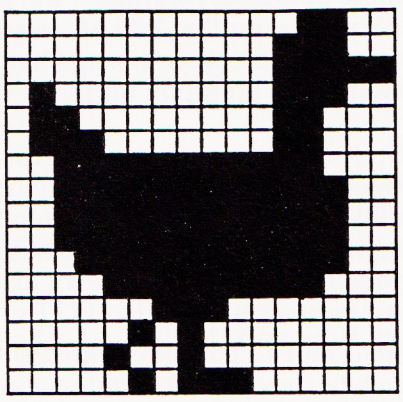


**Fig.1**

Once the child has the shape appearing on the screen she can then give the turtle a direction and a speed at which to move. The options to change the colour of the shape and whether or not to draw a line are also available.

```
SETCOL 4 PU SETH 90 SETSP 40
```

The turtle will then change the colour of the shape it is carrying to colour number 4 and move across the screen at a speed of 40, without drawing a line.

It is possible to build up larger shapes by using more than one turtle. For example, if you wanted to create a large shape of a giraffe you could use one sprite to be the giraffe's head and neck and another sprite to be the giraffe's body and legs. These can then be fitted together and addressed to make them move together.

```
TELL 0 SETSH 12 SETCOL 4
TELL 1 SETSH 13 SETCOL 4
ASK [0 1] [PU SETH 270 SETSP 30 ST]
```

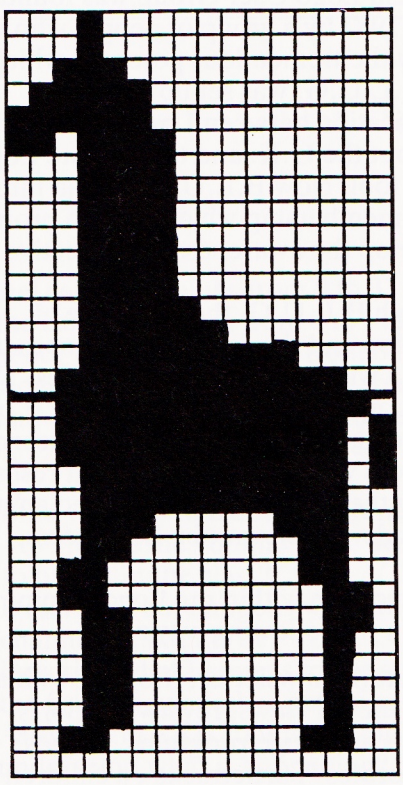


**Fig. 2**

The other really exciting possibility when using sprites is that of simple animation. It is possible to create two shapes, only slightly different from each other and then, by swopping quickly between the two, create the illusion of movement.

```
TELL 0 SETSH 5 ST
REPEAT 20 [SETSH 6 WAIT 10 SETSH
5 WAIT 10]
```

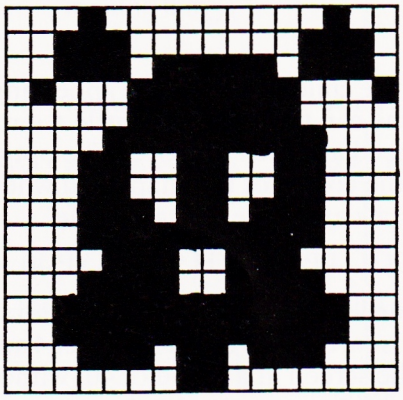


**Fig. 3**

The child can use the sprites to create exciting scenes which can be filled with colour, movement and sound. A castle can have a portcullis that may be lifted and lowered, a flag that can fly in the breeze, guards that can patrol the battlements and knights on horseback that can charge each other in jousting tournaments . . .

As you can see the possibilities are endless.

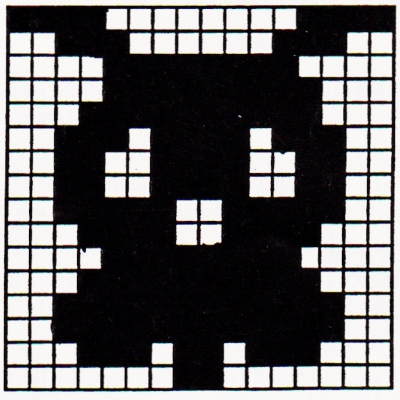


**Fig. 4**

# What is B.L.U.G.?

The British Logo User Group was founded in October 1982 by a group of people who were all seized by the tremendous potential which Logo offers. B.L.U.G. was set up to ease communication between Logo users scattered throughout the U.K. and to promote Logo as a thinking tool. Now B.L.U.G. has an international membership which aims to promote and develop the awareness and effective use of Logo.

Through B.L.U.G. the exchange of information and sharing of experiences takes place on a wide variety of Logo topics. These include Logo hardware and software, Logo publications, personal teaching and learning experiences with Logo, and current research involving the use of Logo; or indeed anything else considered relevant by Logo users.

Communication within the Logo community is assisted in the following ways:

A quarterly newsletter, 'Logos', with articles, letters, news, views, reviews, reports, tips, tool kits and Logo programs. 'Logos' incorporates 'Turtletracks', a children's Logo magazine.

A Logo Almanack consisting of conference papers and other articles.

Occasional publications representing specific research, reviews or collation exercises.

An annual Conference. This is the major European Logo gathering offering a national and international forum for teachers, researchers and Logo enthusiasts to exchange experiences and reflect upon issues and recent developments in the use of Logo and computers in education. Activities include keynote addresses, seminars, workshops, plenary sessions, the A.G.M. as well as exhibitions, demonstrations of hardware and software, and literature displays.

B.L.U.G. is not an exclusive 'in-group' for programming experts, but a voluntary organisation for Logo users, open to any bona fide individual, organisation or institution interested in Logo, at any level of expertise.

Please contact B.L.U.G at PO Box 79, Walsall, WS5 3RW for membership details.

LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...

# Music

LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...

## Sounds (1)

Type in the following procedure:

```
TO MUSH
REPEAT 12 [SOUND 1 -8 65 10 SOUND 1
-8 55 10]
END
```

Now type MUSH and press <RETURN>
Try different numbers in place of 65 and 55.
Make each of the 10s a different number. Can you:–

(i) Make the volume more acceptable to others in the class?
(ii) Find what happens when the channel number is 0?
(iii) Make a sound similar to a police car? ambulance? fire engine?
(iv) Make a sound like a car engine starting?

Type in the following:–

```
TO SIREN
MAKE "VOLUME -1
REPEAT 12 [SOUND 1 :VOLUME 65 10
SOUND 1 :VOLUME 55 10 MAKE
"VOLUME :VOLUME -1]
END
```

Can you:–

(i) Make the siren sound as if it is travelling away from you?
(ii) Make the siren sound as if it is approaching you and then going away from you?
(iii) Make a sound of a passing railway engine?
(iv) Make a sound like a monster walking by?
(v) Make a sound like a marathon runner passing by?

## Sounds (2)

Try:–

Type in the following procedure.

```
TO MUSIC :FREQ :DUR
SOUND 1 -10 :FREQ :DUR
MAKE "FREQ :FREQ + 4
MUSIC :FREQ :DUR
END
```

Now type in MUSIC followed by two separated numbers, e.g. MUSIC 5 5. Now try different numbers after the word MUSIC.

**Hints**

SOUND is always followed by four numbers: the channel, volume, frequency and duration respectively.

Channel can take values from 0 to 3.
Volume can take values from 0 to –15.
Frequency can take numbers from 0 to 255.
Duration is the length of time the sound is played and can take any positive number.

Can you:

(i) Find which is the loudest volume, 0 or –15? Make the volume more acceptable to others in the class?
(ii) Describe what happens when the channel number is 0?
(iii) Describe what happens to the sound as the frequency number gets bigger?
(iv) Alter the MAKE statement and understand what is happening?

Find the duration number needed to make the sound last for 5 seconds/10 seconds?

Alter the procedure to the following:

```
TO MUSIC :FREQ :DUR
SOUND 1 –8 :FREQ :DUR
SOUND 2 –8 :FREQ + 4 :DUR + 5
SOUND 3 –8 :FREQ + 6 :DUR + 10
MAKE "FREQ :FREQ + 2
MAKE +DUR RANDOM 25
MUSIC :FREQ :DUR
END
```

Now try typing MUSIC followed by two numbers e.g. MUSIC 64 12

Try changing the MUSIC procedure by adding or deleting lines or by using different numbers.

# Music Logo

**Laura Bowen** and **Kavita Jain**
*Delves Junior School*

The following set of procedures were written by two pupils at Delves Junior School. They utilise the Music Logo extensions available from Logotron. The tune played is *Clair de la Lune*. The reason this listing is shown is to indicate the use of abbreviations for quaver, crotchet and semibreve as well as the final structuring of the tune into bars.

```
TO SCALE :NO
SC :NO
C D E F G A B SO :NO + 1 C C SO
:NO B A G F E D C
END

TO SC :NUM
SETVOICE :NUM
END

TO BAR1
. G G G A
END

TO BAR2
d B A
END

TO BAR3
. G B A A
END

TO BAR4
o G
END

TO BAR9
. A A A A
END

TO BAR10
d E E
END

TO BAR11
. A G F# E
END

TO BAR12
o D
END

TO BAR13
. G G G A
END

TO BAR14
d B A
END

TO BAR15
. G B A A
END

TO BAR16
o G
END

TO . .
QUAVER
END

TO SO :NUM
SETOCT :NUM
END

TO d
MINIM
END

TO SBREVE
SETDUR 32
END

TO o
SBREVE
END

TO SEMBREVE
o
END

TO .
CROTCHET
END

TO CLAIR :NUM
SO :NUM
REPEAT 2 [BAR1 BAR2 BAR3 BAR4]
BAR9 BAR10 BAR11 BAR12 BAR13 BAR14
BAR15 BAR16
END
```

Now try CLAIR 1.

LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...

# Logo News

LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...LOGO...

## Irish Winner in International Logo Contest

**Dr. Gerard M. Enright**
*Head of Department, Department of Mathematics and Computer Studies, Mary Immaculate College, Limerick, Ireland.*

*First place in the Logo Division of the International Computer Problem Solving Contest has been awarded to an 11 year old Irish boy, John Farragher, a sixth class pupil at St. Paul's Primary School in Limerick, Ireland and a participant in a computer project for children of high ability in Mathematics at Mary Immaculate College of Education in Limerick.*

The International Contest is organised annually by the University of Wisconsin in the United States and it mainly involves computer programming problems for second level students. The inclusion of a Logo Division for children under thirteen in this year's Seventh Annual Contest reflects the ever-increasing use of computers and the particular interest in Logo in primary schools. A Logo Division for the under sixteen age group is planned for inclusion in the 1988 Contest.

John Farragher's achievement is all the more remarkable when one considers the short space of time in which his programming skills were developed. 'The first time I sat down to a computer', said John, 'was early September 1986 at the start of the school year. It was then our teacher Mr. Hanrahan introduced the computer language Logo to the class. At the start we concentrated only on graphics and our first exercise was to draw a house with a door, two windows and a chimney.' In addition to using two computers which he has in his classroom, Pat Hanrahan also brought all the children to the Computer Centre at the nearby College of Education for two-hour sessions every second week. This gave them greater access for concentrated work and considerable progress was made.

John soon emerged as a class leader and was immediately selected when Dr Pat O'Sullivan asked all school principals in Limerick City to send two or three sixth class children of higher than average mathematical ability to College for testing. Dr O'Sullivan was organising the special Logo project for mathematically bright children for Mary Immaculate College which is conducted in association with St. Patrick's College, Dublin. John was one of the eighteen children who came out of the screening process and undertook an eleven-week intensive Logo course taught by Pat O'Sullivan and Gerrard Enright. In April he and fellow pupil Ryan Meade entered as separate teams at the Dublin venue of the International Contest.

The contest was in the form of a two-hour practical examination held at the Holy Faith School in The Coombe and organised for the Computer Education Society of Ireland by Mr. Michael Brady. John solved the five problems with which he was presented in about an hour and a half and he spent the remaining thirty minutes checking his solutions. 'I was satisfied afterwards with the way the test had gone', he said 'and I enjoyed the weekend in Dublin in my uncle's house with the family'. John Farragher won that event, Ryan Meade was placed third and John's entry was sent to the University of Winconsin for ranking amongst 370 teams from all over the United States and from several other countries. A few weeks later everyone associated with John and with the Irish section of the contest was delighted to hear that he had won out worldwide and could be hailed as Logo World Champ.

As soon as the result was announced it became local and national news. Reporters and

photographers called to the school and contacted the college. The story appeared in at least five newspapers accompanied by John's smiling face. School Principal Mr. Tony Fitzpatrick expressed the pleasure felt in school. 'The teaching staff and pupils are absolutely thrilled with John's outstanding achievement', he said. 'John has exceptional talent', said his teacher. 'He is top of the class and very good in all subjects'. Pat O'Sullivan was quoted as saying: 'John's exceptional talent at program writing would leave many teachers flabbergasted', and he went on to express the hope that children with such talent would have the opportunity to develop it further while at secondary school. John, whose excitement was shared by his parents, Sean and Mary Farragher and by their three other children, remained cool throughout and when the the reporters asked for his reaction to the win, his simple answer was 'Great'.

The Computer Education Society of Ireland has been active for many years in the promotion of the use of computers in schools and in recent years it has paid particular attention to encouraging such development at primary level. Mary Immaculate College, through its Department of Mathematics and Computer Studies, is also playing a central role in this area of curriculum development. It provides pre-service courses for its own undergraduate students and in-service courses for practising teachers. It also undertakes a major programme of experimental research with local school-children and it has initiated a one-year teachers' course for a Diploma in Computer Studies which is acting as a very effective catalyst in primary school computing activities. Pat Hanrahan summed up the feelings of his teacher colleagues and of college staff when he said, 'The fact that a pupil from Limerick can compete with some of the brightest children from around the world is a source of great encouragement to us all.'

Lest the reader might think that there is nothing else happening in Limerick except boring unhealthy computer work, we conclude this report with John Farragher's own account of his other main interest - sport. 'Besides my interest in computers I also enjoy Gaelic Football and though I am by no means a giant I still manage to survive in with the bigger boys. This year I've played with lots of teams. The school under eleven-and-a-half team, on which I captained and played full-back, won the schools championship. I played corner-back for the school's under 13 team who were beaten in the semi-final. I played wing-back for the Community Games team which just failed to qualify and I'm playing corner-back for the Mungret Club. I also enjoy Soccer and play for both Regional and the Community Games Team. I enjoy watching sport on television as well.'

# The Insignificance of Logo – Stop 'Mucking Around' with Computers

**Robert R. Plourde**

May 1985 - Dr Henry Jay Becker, research scientist at Johns Hopkins University and guest lecturer at Stoke Rochford for a seminar on computing, told a gathering of sixty teachers from the United Kingdom and the United States to 'stop mucking around with computers!'

Hank, as his closer acquaintances call him, must have meant the above mentioned words of wisdom for the other fifty-nine members of this group because I most certainly was not mucking around for I was enlightened by Seymour Papert in the use of Logo. One could not miss with the Logo computer language. Just plug in the computer, load Logo and let children learn. Computer graphics, turtle geometry, logic, creative thinking, problem solving, and structured programming were but a few of the many skills and ideas my students had acquired by the time they had completed two years in the Morse Pond School computer laboratory. Or so I thought.

But, Hank Becker, planted some doubts. It is incredible how his words branded themselves in my mind. Put your program to the test. Perform some in-house research to see if your computer curriculum is really helping kids learn. If the results are not significant: modify the program, scrap the program, try something different . . . but collect some data to support or refute what you are presently doing. So I did.

After two weeks of work of work in the UK, a project to test the effect of Logo was begun. First, the fifth-grade teachers (9–10 year old students) were surveyed to determine who might be interested in participating in an experiment whereby some classes would be

using Logo and some would be using some other software but no Logo at all. The response was unanimous, all twelve teachers were willing to help. The second item was the experimental design which would have some implication for which classes I would use. This part of the project was determined during the first two weeks of June, just before the students left on summer vacation. I plodded through a copy of *Handbook of Research on Teaching* by N.L. Gage, and decided on the Post Test-Only Control Group Design.

The school administration, as well as the author, was interested in the impact of Logo in some of the curricular areas. Due in part to the contemporary nature of enrichment in most American schools this topic was picked to be studied, in particular the fluency and flexibility aspects of the *Torrance Tests of Creative Thinking.*

In September of 1985 two teachers' classes were selected on the results of the Short Form Test of Academic Aptitude (SFTAA) from the Comprehensive Test of Basic Skills. Once the two teachers were notified the schedule was arranged so that each of the classes could have one hour of computer time per week for thirty-six weeks. One class received Logo only in the form of instruction with regard to the commands of the language. The other class (control) received only non-Logo-based material and lessons in the form of word processing and some simulations (an adventure game called *ZORK;* science simulations from MECC). Furthermore, the Logo group merely received instruction in the commands necessary to have each student interact with the computer. Few 'creative' uses for Logo projects were demonstrated. This was purposely allowed to 'see' if Logo could 'stand alone' as the facilitator for the creative process in the areas of fluency[1] and flexibility[2].

One must bear in mind that the author was a confirmed Logo enthusiast and advocate. I was convinced that Logo was a necessary aspect of the curriculum as well as a student's life experiences. *Mindstorms*, the noted book by Seymour Papert, had been one of the instruments that opened the avenues which have been traversed since 1984. It was at that time that the Falmouth Public Schools decided, due to parental pressure, that the children in grades 5 and 6 should have access to computers in a laboratory situation and that the vehicle for their first-experiences in computing should be Logo. The individual who had done the most work in computers, in BASIC one might add, is the author of this article and therefore it was only logical that I should be in charge in spite of the fact I hadn't a clue about Logo. In a matter of few months, over summer break and the birth of a fourth child (July 22), over 50 hours of Logo learning from the book *Learning with Logo* by Daniel Watt had taken place.

The data for the experiment was completed by June 1986 and ready for analysis. The results did not look promising. The mean fluency score for the Logo group was 9.22 and 15.65 for non-Logo class. A problem was raising its nasty head. In the area for flexibility, the score for the Logo group was 3.54 and the non-Logo 3.70. Better but not conclusive. The data, when analyzed, resulted in t-scores of $-4.32$ and $-0.0714$ respectively. For an experiment to be conclusive and the rejection of the null-hypothesis (non-Logo experiences improve scores in the areas of fluent and flexible thinking) t-scores of $+1.714$ would have been necessary to meet the 95% confidence level for type I and type II errors. These results, given the parameters of the author's present teaching situation indicated that perhaps Logo, in and of itself, is not as significant as the classroom teacher who provides a stimulating environment and ensures that creative activities are part and parcel of the student's lessons on a regular basis.

As a result of this project, the author has not lost any enthusiasm for Logo but has channelled some of his energies in other directions with regard to computing. Because the students in the Morse Pond School in Falmouth, Massachusettes have such limited access to the computer and because time is such a key factor in a teacher's day, it has become increasingly important to utilize the computer laboratory as a curriculum skills centre. At present (Fall 1987) a pilot program in mathematics and computing is being developed in association with the John Hopkins University research department. Over the next three years, other research projects in science, social studies, and writing will be introduced.

**Notes**

1. fluency - the production of a large number of possibilities or hypotheses
2. flexibility - the use of many different approaches or strategies

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Reg Eyre has produced *A Source Book of Ideas Using Logo*. If you would like a copy, please send a cheque for £2.50, made payable to the College, to him at The College of St Paul and St Mary, The Park, Cheltenham, Gloucs GL50 2RH.


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