



Teacher's Book

Sherston

The Crystal Rain Forest

A Mathematical Adventure into Logo for Juniors

Designed and programmed by Simon Hosler

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Credits and Copyright

The Crystal Rain Forest is a mathematical adventure in Logo for junior school children.

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Programs and Documentation:
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First published in 1992 by Sherston Software Limited,
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With special thanks to Charles Hosler.

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Introduction

The Crystal Rain Forest is an adventure program for upper junior school children. The package has a strong environmental theme based on rain forests and also includes a series of carefully structured puzzles and problems that introduce children to logo in a logical and sequential manner.

The package is ideal to use as the centre piece for topic work on rain forests, conservation and other ecological issues, as an introduction to logo or simply as an adventure in its own right. The adventure contains numerous starting points for all sorts of work on conservation and nature and ideas for further work and resources can be found in the Teacher's Notes in this booklet.

As children progress through the adventure each of the challenges they are presented with introduces a new aspect of logo and as a result they gradually learn how to use logo to create their own shapes and patterns. Each challenge has an accompanying instruction card to help the children if necessary, however, for most children the graphics in the program make the tasks self-explanatory. A copy of *Crystal Logo*, an easy to use version of logo, is included in the package together with a simple instruction booklet for the children.

The Package Contents

In your *Crystal Rain Forest* package you should find:-

4 x 3½ inch discs

★ *Key Disc* - contains the beginning and the end of the adventure

!Fonts (Tabloid), *Crystal Logo*

- *Introduction* - contains the introduction to the adventure
- *Bridgetown* - contains the adventures centred around Bridgetown
- *Forest* - contains the adventures in the forest.

Teacher's Book

Crystal Logo booklet

4 Instruction Cards

2 x A3 Colour maps

2 x A4 Colour maps

2 x A4 Black and White Maps to photocopy

1 x coloured jaguar information card

Using the software

Machine requirements

The Crystal Rain Forest will run on an Archimedes, A3000 or A5000 fitted with a minimum of one megabyte of memory and RISC OS 2 or 3.

Software protection

The key disc is protected and will not copy. This allows us to run our popular approval system. The software may be installed on a hard disc drive but will require the Key disc to be placed in the disc drive to start the software. (See section on hard disc considerations) An unprotected Key disc will be provided when a site licence is purchased or alternatively you can purchase a single security backup disc for a nominal charge. Contact Sherston Software for details.

Before using the software you should make copies of all the discs with the exception of the Key disc.

All our discs carry a life time guarantee.

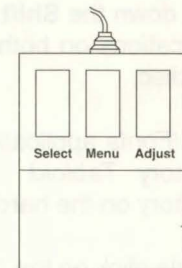
Using the Mouse

Throughout this book the buttons on the mouse are referred to by name:-

Left button **select**

Middle button **menu**

Right button **adjust**



Hard disc considerations

Installing the software

- Create a suitable directory on your hard disc drive.
- Each *Crystal Rain Forest* disc contains an application *!Crystal*. The key disc also contains *!Fonts*.
- Copy the contents of all four discs with the exception of *!Fonts* by dragging the *!Crystal* application into the directory window you have just opened on the hard disc drive. Don't worry about the applications all having the same name, the copying process will combine all the applications into one.

Copying !Fonts

Your hard drive will probably already contain an application *!Fonts*. The font provided with *The Crystal Rain Forest* is Tabloid which is an essential part of the program and must be installed correctly.

Tabloid font is copyright Sherston Software Limited and 4Mation and should not be used outside the purchasing establishment.

To add the Tabloid font to those already on your hard disc:

- Hold down the **Shift** key and double click the **select** button on the *!Fonts* applications on both your hard disc and on the *The Crystal Rain Forest* Key disc.
- The *!Fonts* application on the *The Crystal Rain Forest* disc contains a directory *Tabloid*. This should be dragged across into the *!Fonts* directory on the hard disc.
- Double click on the *!Fonts* application on your hard disc.

Loading the software

Floppy disc users

Place the key disc in the drive and click the **select** button on the floppy disc icon (:0). This will open up a window containing two applications *!Crystal* and *!Fonts*.



Double click on the *!Fonts* application if you have been using fonts from other discs and have not reset your computer since then.



Double click on the application *!Crystal* to load the software onto the icon bar.

Hard disc users

Double click on the application *!Crystal* to load the software onto the icon bar. Unless you have purchased a site licence you will be asked to insert the Key disc the first time you load the software.

If you are using an A5000 which contains a certain number of fonts in ROM you must make sure that you double click the **select** button on the *!Fonts* application on your hard disc before attempting to load *Crystal Rain Forest*.

Starting The Crystal Rain Forest

Once *The Crystal Rain Forest* icon is installed on the icon bar the adventure can be started in one of two ways.

Either:

- Click the **select** button on the icon to begin the adventure at the beginning,

Or

- Select a different starting point from the set up panel, (see Teacher controls), and then click the **select** button on the icon on the icon bar.

Leaving The Crystal Rain Forest

(Ctrl Q)

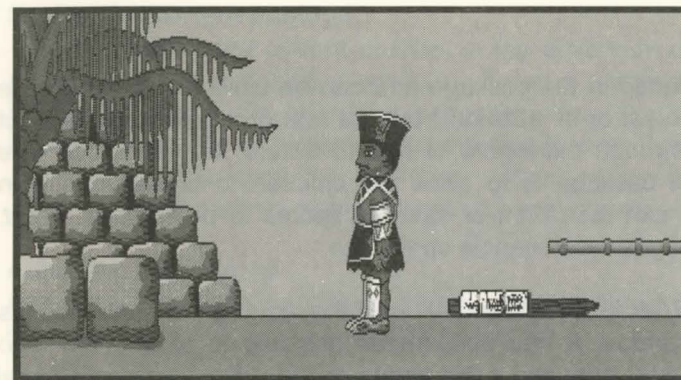
To leave the adventure hold down the **Ctrl** key and press the letter **Q**. The application will remain installed on the icon bar and so you are able to use the set up menu option and save your current position.

Moving around The Crystal Rain Forest

If you are using *The Crystal Rain Forest* for the first time you will probably wish to explore and investigate all there is to see. Moving around *The Crystal Rain Forest* environment is extremely easy.

When ever a screen displays the **Go on** symbol (see page 9) and the two arrows, clicking the **select** button on the arrows will take you on to the next screen.

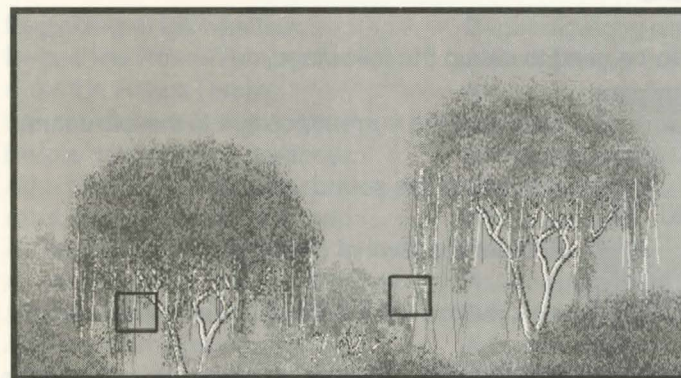
When ever a screen contains small squares like those shown opposite (see page 9) the mouse can be used to explore the picture. You will need to look carefully for these boxes as the variety of colours used on the screen may make it difficult to see some of them.



They took a blow pipe
and a poisoned dart...



Go on



The trees are the homes for rare
animals and plants.



Explore the picture

Crystal Logo

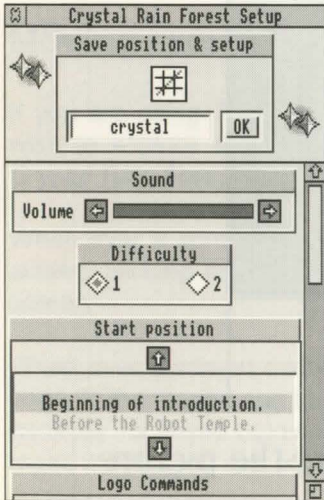
Crystal Logo is included in the package and can be used either along side *The Crystal Rain Forest* or in isolation from the rest of the package without the need to work through the whole of the adventure. Its use within *The Crystal Rain Forest* package is to allow the children to create their own crystals which they can then print or save as sprites to be used in *!Paint*, *!Draw* or other packages which handle sprite files.

Some teachers will already be familiar with the concept of logo and its applications and therefore it has been made possible to amend the logo based commands used throughout the whole of the adventure and *Crystal Logo* so that they correspond with those with which individuals may be familiar. (See Teacher Control section)

Teacher Controls

To access the teacher control panel click the **menu** button on *The Crystal Rain Forest* icon on the icon bar and then click the **select** button on the **Set Up** option on the menu.

The control panel can be used to set up the following:



- to save the current position in the adventure,
- to adjust the sound volume,
- to set the level of difficulty,
- to change the starting point of the adventure,
- to change the logo commands used within the program,
- to change the 'Save area' or directory where screens and logo sprites will be saved. **(Hard disc users only)**

Saving the current position



To save the current position in the adventure drag the icon shown left into a directory window. Enter a name before you save the position. To re-load this position drag the saved icon into the teacher control window or more simply, drag it onto *The Crystal Rain Forest* icon on the icon bar. When saving your position all the current settings within the set up panel are saved.

Adjusting the volume

Adjust the volume of the sound used throughout the adventure by clicking on the arrows to the right and left of the green bar.

Level of difficulty

There are two levels of difficulty. Click on the button next to the level of your choice. Selecting the harder level will mean that the challenges contain extra and usually more difficult problems for the children to solve.

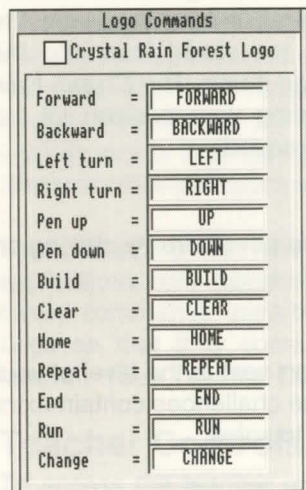
Changing the starting point of the adventure

There are 26 possible starting points for the adventure:

Beginning of introduction.	Begin repairing automatic door.
Before the Robot Temple.	After repairing automatic door.
After the Robot Temple.	As you escape from Bridgetown.
Start to explore Bridgetown.	After meeting floating logs.
Before you help the gardener.	At the two rope bridges.
After helping gardener.	After mending the rope bridges.
After helping gardener + map.	At the saw mill.
As you enter the jungle.	At the lily ponds.
As you enter the jungle + map.	At the brave explorers.
After receiving bag of money.	Before the safety nets game.
After receiving money + map.	After the safety nets game.
At museum shop +money + map.	START CRYSTAL LOGO.
Temple museum with wire menders.	The conclusion!

Move through the options by clicking on the up and down arrows until the one you require is highlighted. Clicking **select** on the *Crystal Rain Forest* icon on the icon bar will then start the adventure at this position.

Changing the logo commands



If the small box next to the left of the words *Crystal Rain Forest Logo* contains a star then the commands used throughout will be those supplied by the *Crystal Logo* program. In this case the commands in the right hand column will be greyed out.

If you wish to enter and use your own commands, click the **select** button on the star to remove it. At this point the commands in the right hand column will become editable allowing you to change as many of them as you wish before saving your position.

Changing the logo save area (Hard disc users only).

This may be changed but only if you are using a hard disc. Floppy disc users see page 13 - **Saving and printing screens**.

The default save directory is `!Crystal.Four.Savearea`.

Creating a new save directory (save area)

Either:

- enter the name of the new directory to be used and drag the directory icon into the directory where this new 'save area' is to be created.

Or

- drag an existing directory icon over the arrow shown below.



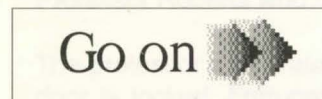
N.B. remember to save your position after you have set up the new 'save area'.

Saving on floppy discs

Before you can save screens, *Crystal Logo* programs or *Crystal Logo* screens onto floppy disc you should first prepare a separate disc. **Do not name this disc Crystal1, Crystal2, Crystal3 or Crystal4** or this will cause problems when saving.

Saving and printing screens

The *Crystal Rain Forest* adventure contains many beautiful scenes which children will no doubt wish to save and print out.



Screens can be saved or printed **only** when the 'Go on' arrow(s) appear on the screen.

Saving screens (Ctrl S)

Hard disc users

Pressing **Ctrl S** will save the whole of the current screen to the Save area defined in the set up box described earlier.

Floppy disc users

Press **Ctrl S** - you will be prompted to replace the **adventure** disc with the disc to be used for saving. Click **OK** to save the screen. You will then be prompted to replace the current adventure disc. Click **OK** to continue the adventure.

Saved screen names

All screens are saved sequentially with the filenames Screen1, Screen2 etc. whether they are being saved to floppy or hard discs.

Each screen is saved as a sprite file and can therefore be transferred to most

other Risc OS applications which accept this file type. Alternatively the file can be loaded into *!Paint* where it can be edited, re-saved and printed.

Printing screens (Ctrl P)

Before attempting to print a screen direct from *The Crystal Rain Forest* adventure you should make sure that you have loaded a Risc OS printer driver which is compatible with your printer prior to starting *The Crystal Rain Forest*.

To print the screen hold down the **Ctrl** key and press **P**. You will not be able to use the adventure while printing is taking place and the time taken to print the screen will depend on the type of printer and the resolution or print density you are using.

Teacher's Synopsis

The planet of Oglo is in big trouble. Its last remaining rain forest is rapidly disappearing as the Cut and Run Gang slice their way through it for profit and greed. The King of Oglo, dismayed by the destruction of his forests, has banned all further tree-cutting, but the Cut and Run Gang poison him and now he lies dangerously ill in hospital and can only be cured by the crystals that are hidden deep within the rain forest. The children can save the King, the rain forest and subsequently the planet by finding the magical crystals, but they will need to be careful as the Cut and Run Gang are out to stop them. Before they can explore *The Crystal Rain Forest* the children need to find both parts of an ancient map and also need to seek help from the elusive Professor Roberts who can be found somewhere in Bridgetown.

The professor's laboratory is inside one of the temples, but unfortunately the door is locked. Fortunately Carlos knows a secret way in, but the children need to help him by guiding the robots found inside the temple to open the doors blocking Carlos's path. However, when they manage to open the door to the Professor's laboratory they find that he is not 'at home' and that they will have to explore Bridgetown to try and track him down.

With the help of a 'town-plan', the children can travel around Bridgetown to search for the missing Professor, but they have to be careful to avoid the Cut and Run Gang who are on the loose around the town. As they explore, the children meet some of the town's other inhabitants, some of whom need the children's help. Esme, the gardener, is having trouble with some of the bridges in the park, and if the children can help to mend them they will be rewarded with a jungle knife. They can use this to cut a path into the edge of the jungle where they will find Herbert's tree house. Herbert packs leaves into parcels that are sent to be used for medicines but he is having trouble making them fit into the bamboo boxes that they are shipped in. If the children can help him he will give them 20 gold coins.

At the Museum shop they can buy a number of items with the money they were given by Herbert. If they spend wisely they will be able to pacify Hiss the snake who is hiding in the secret entrance on the side of the temple museum by giving him some sweets.

At the end of the secret tunnel the children find Professor Robert's secret workshop but the Cut and Run Gang sabotage the door control box before they can enter. However, if they bought a wire mending kit from the museum shop they will be able to fix the control box and get into the workshop. When the children eventually find Professor Roberts their success is short lived as the Cut and Run Gang are not far behind them and before he is able to help them in their search for the crystals he is poisoned just like the King.

Using an underground escape route from the secret workshop, the children have no choice but to set off to try and find the magic crystals for themselves. The journey into the jungle by boat introduces the children to a host of colourful rain forest inhabitants (including some very unusual new friends) and they are presented then with a further series of challenges to complete.

First the children have to learn how to use the boat's computer in order to be able to navigate their way up river. Once they have mastered the boat's navigation computer the children can land at the jetties along the riverside. At the first jetty they are greeted by Manuel who is worried about the condition of some nearby rope bridges which are in a poor state of repair. When the bridges are safe again Manuel gives the children a key that he found near the Cut and Run Gang's saw mill and the children launch the boat again to head further up river.

The second jetty is the landing site for the Cut and Run Gang's saw mill. On exploration the children will find a locked safe inside the saw mill. Fortunately the key that they were given by Manuel happens to fit the safe and inside they will find the second half of the ancient map of the rain forest that they need to complete their task. The Cut and Run Gang themselves are nowhere to be seen, but there are some very strange footprints on the floor!

The next jetty is the site of the lily ponds. Above this point on the river the children no longer have to navigate the boat.

The final jetty on the river is the site of a jungle trading post run by a famous and brave explorer, who for some reason is hiding in a box inside his trading post. When the children find him they discover the reason why! Apparently he has seen monsters over by the waterfall and the children are given the

opportunity of investigating. When they reach the waterfall they see yet more of the strange footprints that they have found in various places up the river together with a message asking the children to help with a final challenge. There are tins of poison floating down the river towards the waterfall and the children need to make nets to catch them. Everything is going well until the last tin of poison is out of reach and is about to go over the falls when it is caught by one of the 'monsters'. These turn out to be rare creatures on the planet Oglo that have been trying to help the children in their quest to find the magic crystals and have in fact gathered up all the remaining crystals for the children. Unfortunately, just as they are about to hand them over there is a terrible accident, the crystals are dropped and before their very eyes, are all destroyed.

Dismayed, and sure that they have failed in their quest to save the king, the children make their way back to Bridgetown. *The Crystal Rain Forest* and the planet of Oglo itself seem doomed. However, when they arrive back in the Professor's secret workshop the computer he was using to try and create magic crystals himself is still working. Perhaps their experiences in the rain forest may have provided the children with one last chance. If the children can create their own magic crystals they may still be able to save the professor, the king and the rain forest!

Teacher's Notes

General

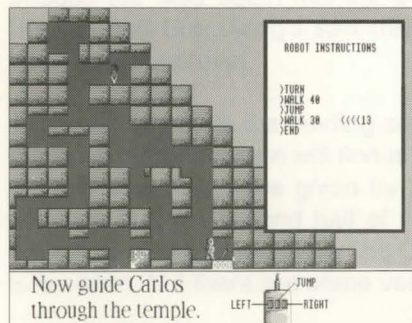
The Crystal Rain Forest has been designed specifically to be both the starting point for all sorts of environmental work and a 'fun' introduction to the language of logo. Whenever possible we recommend letting two or three children tackle the adventure together as they will benefit greatly from the discussion and cooperation involved in trying to solve the various problems.

Ideas for further work are given at the end of these teacher's notes.

The logo challenges

Each of the challenges has an accompanying instruction card to help the children if necessary, however, for most children the graphics in the program make the tasks self-explanatory.

The Robot Temple



In this challenge the children have to guide the robots inside the temple to the door switches so that they can open the doors that are blocking Carlos's path.

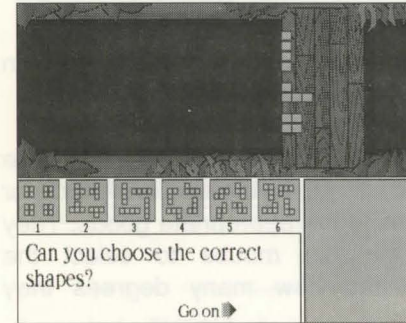
They can select from the instructions WALK, JUMP, TURN, and LEAVE.

Once the door has been opened, the children can use the mouse to lead Carlos himself through the maze and into

Professor Roberts' laboratory. They must use the left and right-hand mouse buttons for direction and the middle button to make him jump.

At difficulty level one there are two mazes for the children to guide the robots through. At level two a third, more complicated, maze is included to stretch children.

The Garden Bridges

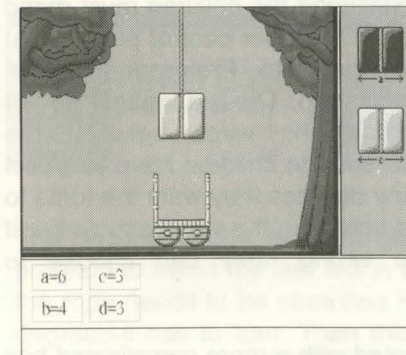


Here the children have to fill in the spaces in the broken garden bridges. First they have to select the correct shapes needed to fill the gaps in the bridges. These will float downstream from the left so they must be careful to choose the shapes in the correct order so that they arrive at the correct time.

As the shapes float downstream, the children have to use the mouse to TURN them, or move them UP or DOWN so they float into the correct place. If they make a mistake, the children can RESTART. If they are happy that the shape is in the right position to float into the gap they can float the shape in more quickly by selecting FIT.

At level two in this challenge a third, more difficult bridge is included.

Monkey Puzzle



In this puzzle Herbert is having trouble fitting his packages of leaves in to the bamboo boxes that they have to fit into. The children have to change the size and shape of the boxes so they will fit properly. The different dimensions of each parcel is represented by letters and the children should use the mouse to choose which measurement to change, and then to select the new length. They may need to change the length of more than one side.

At difficulty level two the children will be shown boxes of three different types, offering them six possible dimensions to alter. (Level one uses only two box

types).



Automatic Shop

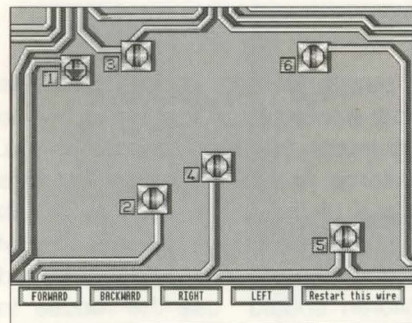
Shopping wisely here will help the children find Professor Roberts.

To select the goods they want to buy the children must move the automatic pointer so it points to the appropriate goods. They should use the mouse to select the direction and how many degrees they

want the pointer to move.

The items they require are sweets, to satisfy the hungry snake Hiss, and the wire mending kit.

There are no differences between difficulty levels in this activity.



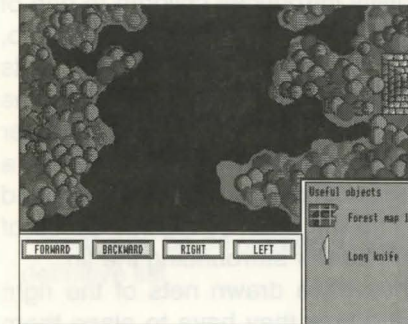
Wire Connections.

In this challenge the children must mend the wires in the door control box so that they can get into Professor Roberts' secret workshop. The red triangle (turtle) will re-draw the wires between the terminals and the children have to select how many degrees they want the turtle to turn and how long the wires should be. If they go wrong, they can choose to

RESTART the wire.

At difficulty level two the children are presented with a more complicated box to mend.

Travelling up the River



Lower and Upper River: To travel up the lower part of the river the children have to give the boat one instruction at a time.

Middle River: To make progress in the middle river the children need to make a list of instructions for the computer on the boat to follow. They must select how far FORWARD or BACKWARD they want the boat to move and how many degrees

it needs to TURN before moving. They should take care to build up the list of instructions in the correct order to help them they can TRY a COURSE to see where it will take the boat before actually deciding to use it.

Rope Bridges



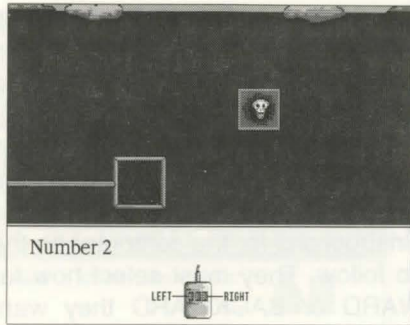
In this activity the children have to mend some rope bridges that are unsafe.

When mending the first bridge the children are given the program which will mend one link of the broken bridge. They then have to add instructions to say how many times the movement needs to be REPEATED, and when the repeats need to END in order to complete the repair.

The second bridge is more difficult as children have to build their own program to mend the first link in the bridge. They will need to include how far the rope needs to be stretched FORWARD or BACKWARD, and how many degrees it has to turn. Then they need to include the number of times the procedure has to be REPEATED and when it needs to END.

At difficulty level two a third, more complex, bridge is included.

Safety Nets



This activity introduces children to one of the most powerful commands in logo, BUILD. The children have to 'draw' nets of the right shape and size to catch tins of poison that are floating down the river towards the waterfall and must create a list of instructions to draw a line around the tin. The line must be exactly on top of the green border surrounding the tin.

Once they have drawn nets of the right shape and size they have to place them

in the correct order to catch the tins of poison as they fall over the waterfall using the left and right-hand button on the mouse.

At difficulty level two a third, more complex, shape of tin floats down the river.

Ideas for Further Work

The Crystal Rain Forest includes numerous starting points for all sorts of work away from the computer covering most areas of the curriculum and is therefore ideal to use as the central theme to a class topic. Alternatively you may wish to use the package simply as a fun way to introduce and develop logo with your children.

The following sections include just some ideas as to how *The Crystal Rain Forest* may be developed in the junior classroom and is not intended to be a definitive list.

Mathematics

The Crystal Rain Forest contains a great deal of mathematics, not least in the form of the logo programming language. There are many examples to show how mathematics can help us in every day life such as making the leaf parcels fit into the bamboo boxes.

- **Logo.** Once they have worked through the adventure children will be able to use logo to design their own shapes and patterns. You can use the *Crystal Logo* supplied with the package to let the children make their own designs or any other logo you have available. The commands used in *Crystal Logo* can easily be altered to be the same as other logos if you need to. Please refer to the Teacher Control section for details.
- **Shape.** How many different shapes can the children spot in the adventure? There are several! What properties do they have? Tessellation.
- **Rotation Translation and Reflection.** The shapes in the Garden Bridge Puzzle have to be rotated to fit into the gaps in the bridge and some of the shapes are reflections of others. This could lead to all sort sorts of work on the rotation, translation and reflection of shapes.
- **Area.** Different shapes in the Garden Bridge challenge have the same area . This could be used as a starting point for an investigation into areas of shapes.

● **Angles.** The adventure uses angles in many places when the children have to enter how many degrees to turn left and right. In the Poison Tin challenge this involves working out what the interior and exterior angles of a square and an equilateral triangle are. This could lead to all sorts of work on the interior and exterior angles of shapes and properties of angles in general. The angles involved in turning through a circle could also be explored, leading through the skills involved in the use of instruments such as compasses and protractors.

● **Algebra.** A lot of work can be done looking at the effect that changing one measurement can have upon the size and shape of an object. Use of plasticine or building blocks to bring this into three dimensions. The substitution of a symbol to represent an unknown figure or quantity, can be used in simple games involving addition, subtraction, multiplication and division. The use of algebra to determine missing angles or dimensions could be introduced at a simple level.

● **Money.** The children can spend the 20 gold coins that they get in the adventure at the museum shop. What currency do the children think is used on Oglo? Have any of the children ever been abroad? What other currencies have they come across? How did they work out how much it was worth in British money?

Language

There are many openings for language work, in particular for creative writing. Many of the screens in *The Crystal Rain Forest* can be printed out or saved to be used in other applications. In this way children's written work can be illustrated by using appropriate scenes from the adventure.

● **Creative Writing** There are many openings for creative writing. The story itself is left somewhat open-ended, what do the children think the future holds for the notorious Cut and Run Gang? Very strange creatures live in the land of Bable. What do the children think they look like? Ask them to write descriptions of them. Ask the children to imagine they are creatures which live in threatened rain forest. What does it feel like to have your home

destroyed, to smell trees burning, to watch the soil being washed away from underneath your paws?

● **Jungle Stories.** There are a number of classic stories based in the jungle which you could use as the class story for the duration of a topic. Eg. *The Jungle Book*, *Tarzan*, *The Just So* stories etc. You could read some of Rudyard Kipling's 'Just-So' stories to the children and then ask them to make up their own.

● **Oral Work.** Organise a class debate and ask the children to put forward the different points of view of those people trying to make their living in the forest and those of us some way away who think they should act differently. There are ways of exploiting a rain forest's natural crops without harming the forest. Can the two opposing groups find any common ground that would benefit everyone and the forest?

● **Vocabulary.** Rain forest words. What words can the children think of that can be used to describe rain forests? Animals, and the language involved in describing their movements, smell, feel etc. can be explored.

● **Descriptions.** Ask the children to imagine they are standing in the middle of a rain forest. Ask them to describe what each of their senses tells them about their environment. How does this effect their emotions? Do they feel fear, joy, excitement, sadness, hope?

● **Instructions.** The use of logo involves giving concise instructions. Ask the children to write down the instructions for a simple task. Ask others to try and follow them.

● **Types of Language.** Talk about different styles of language with the children and point out that the logo instructions are all concise and direct. What other styles of language are there? Try asking the children to give instructions to one another, using different types of language. Eg. concise, flowery, aggressive, pleading etc. Ask two groups of children to describe a scene using different types of language.

Science, Nature and Conservation

The Crystal Rain Forest provides a wealth of opportunities for all sorts of work in the areas of science, nature and conservation. There are many books and videos available which deal with environmental issues in general and the threat to the rain forests in particular, which could be used.

● **Rain forests.** What are the characteristics of a rain forest? Where are they found in the world and why are they considered so important? What is the link between rain forests, greenhouse gases and global warming? Why do some people cut them down? What can we do to try and stop the destruction? Parts of the rain forest. Who lives where? On the ground, in the canopy etc.

● **People and Rain forests.** Who lives in rain forests and what do they do? In the past forest people respected their environment. They lived in small communities and used simple farming techniques that did no lasting harm to the forests. Nowadays the forests are often cleared to make more land for more intensive farming which is a vicious circle as once the trees are removed the soil is easily washed away. What are the alternative ways people can make a living out of rain forests?

● **Animals of the Rain forest.** The children come across a number of animals that live in rain forests in the adventure. What can they find out about them? An example information card about the jaguar is included with the pack. Get the children to do their own research and make up their own information cards for the other animals that they come across in the adventure. How do the animals and plants of the forest depend on each other for survival? Food chains.

● **Trees and Plants.** What sorts of trees grow in rain forests? What other plants are found there. Does anything much grow on the floor of a rain forest? Why not? What foods can be found growing in rain forests? Do we eat any of them today? Many fruits and nuts such as pineapples, bananas and peanuts first grew in rain forests but are now mostly grown in plantations, but brazil nuts still come from the forest itself.

● **Natural medicines.** In the adventure Herbert packs leaves which are used to make medicines. Many plants have medicinal value and this is one way that rain forests can be made economically viable. What common drugs are derived from natural substances rather than man made ones? Do the children know about any natural remedies? One of the commonest is probably using a dock leaf to rub a nettle sting! What about other natural medicines? Homoeopathy.

● **Poisons.** Natural and man made poisons. There are many examples of tribes using natural poisons for hunting. What other uses do they have? What do animals use poisons for?

● **Pollution.** The beautiful lagoon behind the Cut and Run's saw mill has been destroyed by pollution. There is something spilling in to the lagoon itself and all the trees look as if they are dead. What do the children think has caused this? Are there any examples of pollution locally that the children can try and find out about? What are the major worries concerning pollution?

● **Water.** Study the water cycle as it occurs in nature. You could use a steaming kettle to demonstrate the principles of evaporation and condensation. Steamed up classroom windows on a wet day will also demonstrate this.

● **Planets.** In the adventure the children are told that on Nep all the trees have died and the animals are dying. Oglo is also in trouble. What conditions do planets need to sustain life? How likely is it that there are other planets that could sustain life? What do we know about the planets in our solar system? Could any of them possibly have life?

● **Bridges.** The bridge in Bridgetown is said to be 50 miles long. What would be the problems of building such a long bridge? How long a bridge can the children build out of materials of their own choosing that will support 50 grams? Who can build the strongest bridge to span a 50 centimetre gap?

● **Circuits.** The children have to mend the wires in the door control box before they can gain access to Professor Roberts' secret workshop. Let the children try their own circuits. Can they build a simple circuit to switch a light bulb on or off? What about a two way switch? An alarm?

● **Robots.** The robots inside the temple can be moved to open the doors to let Carlos through to the entrance. What can robots actually do these days and where are they used? Have any of the children actually ever seen a true robot? Perhaps a local factory has a robot that the children can actually watch in action.

Geography

There are many possibilities for further work on Geography included in the adventure.

● **Rain forests.** Get the children to identify the areas of the world where rain forests occur. What is the definition of 'rain forest'? What proportion of the world's surface is covered by rain forests today? How much was it 50 years ago? What will it be in 50 years time if they are cut down at the same rate?

● **Climate.** What sort of climate does a rain forest need? How does our own climate differ from it? What happens to the climate if you go further south? Is this always the case?

What effect does this have upon the way we live, the clothes we wear, the food we eat? Meteorology and the patterns of weather. Are these being disturbed by developments in other parts of the world?

● **Mapwork.** There is scope for a great deal of work involving the use and construction of maps. Get the children to make their own plans. Start off with simple things that they can actually look down on - the top of their desk for instance, and work up to plans of the classroom, of their bedroom, etc. Ask them to invent their own symbols for various things. Gradually ask them to make plans of larger and larger areas. Ask them what problems they face as the area becomes larger. Get the children to distinguish between maps and plans. The word map tends to be used for large areas like a neighbourhood, town or piece of country while a plan usually shows a much smaller area. How do they think real maps are made?

● **Ancient Maps.** Where do the children think the ancient map of the rain forest came from? The history of maps. Problems that early map makers had. Why did they start making maps in the first place? Gerardus Mercator. Development of techniques. Eg. how did ancient cartographers represent hills? On very old maps they simply drew the features, then as map making became more sophisticated hachures were used to give a more accurate picture.

● **Explorers.** The trading post at the end of the adventure is run by a brave explorer. What explorers have the children heard about? What did the great explorers do? Why was their work important? What wouldn't we know about to day if it hadn't been for the great explorers? Were the explorers always welcome?

● **Forestry.** The children could try to find out about methods of forestry in different parts of the world. What economic factors are involved, including pressures which are leading to the destruction of existing resources? What methods (eg. coppicing) are available that allow us to use wood without detrimental effect?

● **Logging Industry.** In the adventure the Cut and Run Gang are the villains. Is everybody who is involved in the logging industry a villain? Why do we need the logging industry? What do we use wood for? Which of these uses are essential, which wasteful? Which woods are endangered and which are readily available? How can we conserve wood and use less? Could wood replace unrenueable fuels as a source of energy and would it be a good idea? Why does burning wood contribute to the greenhouse effect? How does growing trees benefit the climate and help to reverse global warming?

● **Waterways and Barges.** Although barges are no longer used to any great extent in the UK they are still used a great deal in other parts of the world. Can the children find out where? Is there a canal near you? Are the children aware that there is a vast network of canals in Great Britain?

Art and Craft

The Crystal Rain Forest, can inspire many aspects of art-work in the classroom. Many of the scenes included in the adventure can be used as examples to stimulate the children's own art work.

- **Make your own rain forest!** Ambitious teachers (and children) could turn part of their classroom into their very own rain forest. Use some plastic sheeting or old carpet for the floor and scatter dead leaves, sawdust and logs on it to create the rain forest floor where nothing much grows. You could create the canopy by putting paper leaves in a net fastened to the ceiling and also hanging 'leaves' from it. If there are any windows near your 'rain forest' black them out with black sugar paper to create the darkened atmosphere. If you have curtains in the classroom you could draw them and try using a dark green or dark blue coloured bulb to try and imitate the light conditions in a rain forest. There are numerous ways you could make the trees. If you are lucky enough to be able to get some old cardboard carpet tubes these are perfect to use for the trunks. You could get the children to wrap them with corrugated cardboard to make a bark effect. Alternatively you could use a few old netball posts and use thin card taped to them to make the trunk. Hang creepers, and leaves from the trunks. If there has been any tree pruning nearby recently you could use some real branches (small ones) to give a realistic effect. Finally get the children to draw pictures of animals that are found in the rain forest and put them in appropriate places. Atmosphere could be added by making a rain forest sound effects cassette and playing it in your rain forest. See Music.

- **Animal and plant drawings.** There is a real skill in drawing accurate pictures of animals and plants. Talk to the children about observation and drawing techniques and give them some examples to try and draw accurately.

- **Mythical Beasts.** Get the children to create their own pictures to show what they think the 'monsters' in *The Crystal Rain Forest* look like. This will have to be done before they actually meet them!

- **Zoom Pictures.** The idea of 'zoom' pictures are interesting to the children. If they zoom in on that area, what will they see?

Music

- **Music around the world.** Play the children contrasting music and get them to think about the differences. What sorts of instruments are used? What purposes does music have in different parts of the world? How much has the music of different cultures mixed since international travel became so much easier?

- **Music about Animals.** Let the children listen to sequences from the *Carnival of the Animals* and try to identify the animals portrayed. Encourage them to create their own music for a favourite animal. Get them to consider the size, speed and any unusual characteristics of their chosen animal. Can the other children guess what the animal is?

- **Instruments.** Instruments around the world vary greatly. Get the children to create their own instruments given materials which they might find readily available in different environments. If you can borrow some instruments from around the world do so and make a display. Label the instruments with the country of origin and, if possible, let the children play with them and create their own music.

Drama

- **Animal Movements.** Ask the children to try and move like different animals. How is the way an animal moves affected by the way it is built? How do animals react when they are in danger? A hedgehog curls up, a rabbit freezes briefly before fleeing.

- **Emotions.** Explore, through drama, the experiences of the children as they journey through the jungle. How do they react when they meet the curious monsters? How do they feel when they see the Crystals, and then see them destroyed before their eyes?

Physical Education

● **Patterns.** In P. E. much can be developed along the mathematical principles encountered as the children journey through the forest. The children can programme their own floor patterns, including the instruction 'jump'. How many different ways can they follow the same floor pattern? What body shapes can they adopt as they travel? Can they introduce changes of speed and level?

● **Group work.** Some very impressive results can be achieved with the children working in groups to illustrate reflection, repetition and cannon using a very simple initial program or floor-pattern. Some elementary notation can be introduced as representing movement in a similar way as the 'program' they have created. The areas of rotation, with points or lines of axis, reflection, with mirror lines and lines of symmetry in individual, partner or group-work, can be developed. Translation is harder, but as a group-work piece, this too should be possible.

Health Education

● **Knives.** In the adventure the children are given a jungle knife by Esme the Park gardener. Why should children never carry knives? If they do use knives how can they ensure that they use them safely?

● **Sweets.** The children have to buy some sweets in the Museum shop to satisfy Hiss the temple snake with. How many sweets do the children eat a week? Do they know why they shouldn't eat too many of them? Perhaps you could organise a class survey. Do they know how to eat sweets and do least damage to their teeth? What do they like to eat instead of sweets?

● **Poisons.** Poisons occur in several points in the adventure and provide an opportunity to make sure that all the children are aware of the common poisons found in households and why they should never touch them. This could lead onto other substances that can do you harm like glue, drugs etc.

● **Medicine.** Care with medicines. Why should you never take medicines without a trusted adult telling you to? Where do medicines come from?

R. E. and Moral Education

There are many openings for class and group discussion. Some possible topics are:-

● **Hardwoods v Softwoods.** The use of softwoods rather than hardwoods for our needs. How long does it take to grow a pine tree compared to mahogany?

● **Rain Forest products.** If we stopped buying rain forest products, what would happen to the local people trying to make a living by selling them? Should we stop buying rain forest products, or support campaigns to have trees replaced? What rain forest products (eg. brazil nuts) are encouraging good practice when we buy them?

● **International Debts.** Rain forests are being cleared for short term gain as farm land, to export hardwoods, for mineral exploitation, the development of hydro-electric power etc. In many cases the aim is to pay off huge international debts. Some governments are cancelling these debts in exchange for guarantees to protect the forests. What do the children think of this idea?

● **Different religious beliefs.** Different religious beliefs and folklore around the world can be looked at. Places of worship, churches, temples etc.

● **Law and Order.** The king bans all tree cutting at the beginning of the adventure. Everyone would agree that this was a good law, or would they? The Cut and Run Gang certainly didn't. Why should we obey the law? What different sorts of rules are there? Moral. legal etc.

Useful Addresses and Organisations to Contact

The Worldwide Fund for Nature,

Panda House, Weyside Park, Godalming, Surrey. GU7 1XR

Council for Environmental Education,

Faculty of Education, University of Reading, London Road, Reading. RG1 5AQ

A. R. K.

498-500 Harrow Road, London. W9 3QA

Friends of the Earth,

26-28 Underwood St. London. N1 7JQ

Watch Trust for Environmental Education,

The Green, Witham Park, Lincoln. LN5 7JR

The Conservation Trust, The National Centre for the Environment,

George Palmer Site, Northumberland Avenue, Reading, Berkshire. RG2 7PW

Greenpeace

36, Graham Street, London. N1 8LL

Earthlife,

10, Belgrave Square, London. SW1X 8PH

U. K. Council for the Protection of Rural England

Warwick House, 25, Buckingham Palace Road, London. SW1W 0PP

The Association for the Protection of Rural Scotland

14a Napier Road, Edinburgh. EH10 5AY

Plantlife

c/o The Plantlife Secretary, Natural History Museum, Cromwell Road, London. SW7 5BD

Royal Society for Nature Conservation

The Green, Witham Park, Lincoln. LN5 7JR

Countryside Commission

John Dower House, Crescent Place, Cheltenham, Gloucestershire. GL50 3RA

The National Trust

36 Queen Annes Gate, London. SW1H 9AS

Forestry Commission

231. Corstorphine Road, Edinburgh. EH12 7AT

Department of the Environment

Room A302, Romney House, 43, Marsham Street, London. SW1P 3PY

Nature Conservancy Council

Northminster House, Peterborough, Cambridgeshire. PE1 1UA.

Children's Tropical Forests UK

c/o Tina Jolliffe

The Old Rectory,

Market Deeping

Peterborough PE6 8DA

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