TREES: MYTHOLOGY, ECONOMICS & ECOLOGY

A Thesis by Padraic Tierney

N C A D

May 1979

THE NATIONAL COLLEGE OF ART AND DESIGN

TREES; MYTHOLOGY, ECONOMICS AND ECOLOGY

A thesis submitted to:
THE FACULTY OF HISTORY OF ART AND DESIGN

IN CANDIDANCY FOR THE DIPLOMA
FACULTY OF FINE ART
DEPARTMENT OF SCULPTURE

BY
PADRAIC TIERNEY
MAY 1979

"Nature cannot be commanded except by being obeyed".

- Sir Francis Bacon.

CONTENTS.

INTRODUCTION.

This thesis is written as a result of both my sculptural interest in wood and my having worked as a lumberjack in the Blackforest, Germany. It is an attempt to broaden ones knowledge and understanding of trees, and to explain their functions in relation to primative man and in contrast to present day activity. To-day many people believe that their only function is to beautify our cities and landscapes along with supplying us with inexhaustable amounts of wood. This is not entirely true, trees have become part of our history and culture. They have played a major role in the evolution of man, providing him with fuel, tools and shelter. They have appeared constantly as sacred objects in the long history of religion. Their symbolic importance is a recurring theme in cultures throughout the world, representing birth, regeneration and life itself. It is the one basic resource that can be renewed. Man has no older or deeper debt, yet over the last centuries, many of our forests have totally disappeared. To-day deforestation continues at an alarming rate. It would appear that nature had created them for nothing. Man could harvest them for profit; future timber-uses are hardly considered. This outright exploitation will lead to environmental disaster, if the reserves already destroyed are not re-planted and new plans put forward for future forests.

THE TREE OF LIFE.

The first true land plants appeared some 450 million years ago. They had no true leaves or roots, but from them the first species large enough to be described as trees emerged at the middle of the Devonian period. They were small by comparison with modern forest trees, but by the late Devonian period (395 millions of years ago), giant mosses and ferns had evolved more than a hundred feet high.

With their roots in the ground, their trunks rising through the plane on which we live, and their branches and leaves above our heads, trees span the three levels of Man's experience. Their symbolic importance is a recurring theme in cultures throughout the world, representing birth, regeneration and life itself.

Trees feature in many myths about the creation of the world. The Scandinavian mythological ash tree Yggdrasil represents the cosmos and provides the bridge between the heavenly and terrestrial spheres, by which the gods descended to go about their work of creation. In Dahomey and in Haitian voodoo the tree is the symbol of the backbone and also a bridge by which the messenger of the gods, Legba, descends to earth and into the bodies of the initiates - who then become possessed.

The tree is a kind of skeleton holding up the body of the world. It is also the symbol of growth, of death and rebirth, and of fertility. Its shape makes it an obvious symbol for the erect phallus, and it has been widely represented and worshipped as such. The water it draws up from the ground and the sap which permeates the trunk are similarly symbols of semen, and the explosion of leaves in spring is the very image of birth and life. To understand this a brief outline of tree Anatomy is necessary.

Leaf Anatomy:
The leaf has a protective outer layer, the epidermis; a middle mesophyll, which contains the chloroplasts needed for photosynthesis; and the central vascular bundles of xylem and phloem cells, which carry nutrients to and from the leaf.

Stem Anatomy:
A tree grows in thickness by the activity of a single laver of cells called the cambium. This produces sapwood, or xylem, on the inside and bark, or phloem, on the outside. As the cambium continually divides, the first-formed xylem cells become progressively detached from the cambium, undergoing chemical and physical changes to form the distinctive heartwood.

Root Anatomy:
Small hairs on the roots extend into soil and take up moisture by the process of osmosis. Mineral salts essential to growth are also absorbed and pass into the water stream. The solution enters the xylem vessels of the roots and is distributed throughout the tree. Ninety-nine per cent of the water is lost through the stomata of the leaves by evaporation. There is, therefore, a continuous movement of water through the tree and on a summer day an oak may take up more than 100 gallons.

In Tonga, in the South Pacific, men are said to have grown as sprouting shoots from the "world tree", while in the Admiralty and Banks islands it is thought that Man was first carved from the trunk of a tree. Egyptian tomb-paintings often portray the earth-goddess leaning out of a tree of which she is a part,

offering her breast as a source of life.

The tree also represents death, the tree of hanging in the West, and of the crucifixion. The Cross and the Tree of Life have been mystically linked by Christians. According to medieval legend, Eve planted a branch from the Tree of Knowledge on Adam's grave, where it grew into a tree whose wood was finally used to build the Cross.

The tree is in fact a symbol of the whole cosmos, not only in physical but also in moral terms. It is the tree of knowledge, of both good and evil; it is the tree of life and of death. It is the world.

INSTRUMENTS OF BELIEF.

Protected by all the trappings of civilization, Western Man has largely ceased to fear anything more than his own potential for destruction. But outside this material cocoon, the world still appears a dangerous and even hostile place. Lacking the strong teeth or sharp claws which other animals have developed, Man relies on tools to control his world. The immediate availability of wood, and the comparative ease with which it can be shaped, has made it an obvious material for this purpose. When someone is using a mallet it is obvious what is happening, but some"tools" have a less obvious function.

Mechanical manipulation of the visible world represents only one of the ways in which Man has sought to control events and his surroundings. For most of history, and for most men still,

the forces from which Man has sought to protect himself, and finally to use for his own purposes, are as much mystical as mechanical. According to this view, the cosmos is controlled by abstract and personal forces - strength, good, evil and fertility - and the gods, spirits, devils,and demons who represent them. These spiritual agencies are in varying degrees like Man himself, and if they can be correctly identified and communication established with them, then they may be persuaded to exercise their powers for Man's benefit and at his request.

As one material from which instruments are fashioned for these purposes, wood has represented a wide range of beliefs and has acquired a whole mythology of its own. Specific woods may be prescribed by tribal traditions, methods of felling trees follow strict patterns, and ways of carving remain faithful to ancient designs. The Iroquois Indians of North America insist that their False Face masks be cut from within the tree, usually an ash; the Maoris use soft woods, which are easily carved; while the Marquesans, anxious that their carvings may be preserved, will use hard, close-grained woods, which give their article the desired permanent status.

For the individual, wooden instruments of belief have three main functions, perhaps best described as "definition", "communication", and "protection". Definition of relationships and roles is part of the process of manipulating abstract forces, so the individual human must first define himself. This may be done by putting on a mask which claims, in effect, a particular identity. It states what the individual is doing, what social group he belongs to, what function he is performing in a particular cermony, or whom or what he represents. The mask may thus be of an ancestor or of a particular spirit or god, and, by putting it on the individual also puts on, for the time being, that personality and performs that role. Just as a mask defines a character in the Japanese Nō theatre, elsewhere too it defines the role, and usually defines it as part of the sacred sphere of action. This sphere concerns

abstract and invisible forces, which are also made perceptible by the use of other ritual objects, like flutes and drums, alters, wands, sacrificial fires, carvings and paintings. Wood is employed for all such objects; they are tools for communicating with the invisible world.

In the Niger Delta, the Ijaw people carve small wooden figures as spirit companions, through whom they speak to their ancestors. It is said that when pleas for help are heard, the figures tremble. Wood is also used to communicate with particular spirits when it is employed in divination. The Ifa board of the Yoruba people in West Africa helps not only determine present facts but to guide future actions, as does the rubbing-board oracle of the Azande farther east.

Communication in this sense often overlaps with the desire to seek help or protection. Wooden amulets are designed to do this directly. The Chinese would carry pieces of peachwood to ward off evil spirits. Hopi Indians kept bits of petrified wood as lucky charms, while the Iroquois carried miniature wooden canoes to save them from drowning. To "touch wood" as a safeguard against tempting fate originates from the many sacred and magic properties attributed to different woods.

TREES AND RELIGION.

Trees have played a central role in Man's rituals from time immemorial and sacred groves appear at all times. Man's earliest temples were simply clumps of trees, whether hidden in the depths of forests or growing prominently on some significant hillside. Prehistoric circular temples like Woodhenge in southern England may have been built in imitation of these natural woodland temples, and it is possible that the

lofty pillars and vaulted roofs of later churches owe their origins to the natural forms of these distant forerunners.

Throughout the long history of religions, wood and trees appear constantly as sacred objects. This sacred character sometimes derives from a symbolic relationship which the trees bear to a spiritual force or being, but sometimes it expresses a sacredness belonging directly to the tree itself.

Spirits, whether dryads, the attendants of the goddess Artemis, or other nature spirits like the Nagas, the sacred cobras of India, who bestow rain and fertility, are believed to dwell in trees and, in a natural development of the mythology, the tree has become so identified with the spirit that the two are almost inseparable.

Specific trees are worshipped as gods all over the world. The oak tree, sacred to the Druids, symbolized strength and offered protection. The cedar was revered in ancient Lebanon by Christians, Hebrews and Muslims alike, each for their own different reasons. Carried in the exodus from Egypt, the wood from the acacia tree was used by the Israelites to build their holy objects, the Tabernacle and the Ark of the Covenant. The Bo tree is sacred to Buddhists, because Gautama Buddha sat meditating beneath it until he found nirvana, and the Banyan tree is revered by Hindus, who believe that Brahma was transformed into one.

Rituals held on special occassions, particularly those marking climaxes in the annual cycle, like the spring equinox or the harvest, often employed, and still do employ, wooden objects, partly because wood is itself organic; its own cycle of growth makes it particularly appropriate to occassions which are linked to the natural seasonal cycle. The maypole and its attendant festivities - a familiar sight on English village

greens even today - are remnants of the ancient spring fertility rites of pre-Christian Europe. In Ancient Rome, in spring, a pine tree symbolizing Attis, the lover of fertility goddess Cybele (himself born of the almond tree), was carried to her temple on the Palatine Hill. Similarly, throughout northern Europe, youths would go out to the woods and bring home decorated tree branches, phallic symbols of many fertility rites around which they would dance.

While many trees, and woods, are believed to have sacred powers in their own right, many hundreds more have had powers attributed to them through the complex web of mythology and belief which ties Man to his natural environments.

Examples In Folklore.

1. Rowan:
Rowan is a charm against witchcraft in European folklore. Protective rowan crosses, made without using a knike, are tied to cows' tails in the Isle of Man on May Eve to protect them from evil influences.

2. Ash:
Ash is renowned for its protective and curative properties. Its wood is thought to cure warts, and a child, if passed through a split sapling which is then bound up, will be cured of rickets or ruptures.

3. Yew:
Yew trees may symbolize both life and death. Once sacred to Hecate, queen of the underworld, they are found in almost every English graveyard, their evergreen quality representing the triumph of everlasting life.

4. Willow:
One of the best divining woods along with hazel and birch, is a symbol of mourning and forsaken love. Full of magical properties, it brings luck in childbirth and is thought to cure the old and sick.

5. Hawthorn:
Hawthorn is ambivalent in country lore: to bring its blossom into the house foretells a death in the family, while sitting under the tree on Midsummer Eve or Hallowe'en can cause fairy enchantment.

6. Elder:
Despite its medicinal properties, elder is unlucky perhaps because Judas hanged himself on its branches. Witches transformed themselves into elder and, if cut, the wood is said to bleed.

7. The Sacred Oak:
Throughout the northern hemisphere the oak tree, and oak groves, enjoy a rich and varied mythology. Oak was the Norse tree of thunder, sacred to the god Thor, and gave protection to those sheltering under its boughs. If struck by lightning, pieces of the shattered wood were kept as protective amulets. The oak was also held in reverence by the Druids, as a symbol in its own right and by association with the sacred mistletoe - the guardian of the tree's life during the winter.

ANCIENT VERSUS MODERN IDEA OF NATURE.

We have come a long way in this story from the conception of trees as gods. A very long way indeed. For many centuries the land had remained under the equilibrium of the Natural Order. Suddenly it was broken in upon by a race of men with a violence and hatred against all living things. There had never been anything like this before in the history of man, and Nature. There had been many civilizations. Men had grown up with Nature in this place and that place. They had seldom been wise or good in their relations with earth. They had made many mistakes, huge blunders in tree-killing, soil-injury, and water-wastage for which they had been repaid with dust and sand. But there had never been anything like this that occurred, and occurs, in modern days under the sign of mechanism. When we think of the ripping up of the grass in every direction, of the crashing down of huge trees under the axe and the deliberately lit forest fires rushing forward at the rate of an express train while thousands of animals shriekingly fled in terror from the crackling flames till exhausted they were burnt alive, our minds and our hearts turn back to the primal days of religion and reverence.

THE CAMPAIGN AGAINST THE FORESTS.

Having conquered the lands, man turned to Nature. They found themselves confronted with a mighty host. It was unarmed. It could not defend itself. It could not even retreat, for it was rooted to the ground. Being pious folk, the invaders saw that God was clearly not on the side of these green battalions.

The forest was an enemy that could ~~not~~ be destroyed. And they set to work to destroy it.

Two immediate objectives were to be gained: first, room in which to grow crops, and second, the supply of timber with which to build the new civilization and to maintain it with fuel. It was a big job, this subduing of the wilderness. It took toughness and time before the first 100 million acres of trees had been brought down. They went at it with a will. They launched a campaign against the forest with a virulence that seemed akin to hatred. They went out against the forests with the thoroughness of an invading army, attacking first one stronghold then another. For a hundred years the white pine trees of New England held out. Then one day it was found that all had fallen on that field. After the white then the yellow. The movement of destruction advanced relentlessly onwards from the forest of Maine to New York. In ten years those battalions were defeated and the lumber-troops entered Pennsylyania and Ohio and Indiana, from whence they moved in turn to Michigan, to Wisconsin, to Minnesota, and thence again through the Rocky Mountain region on to the Pacific Coast. That was the northern campaign against the trees. There was a similar offensive in the South, from the Carolinas to Texas and on through Arizona and Colorado.

To-day it is reported that seven-eights of the continent's virgin forests have disappeared and that only the Douglas fir is making a last stand along the fifty-mile front between the top of the Cascade Mountains and the Pacific.

The method throughout this tree-war was that of clean cutting, complete clearing without any policy of further yields. It was applied to areas which had no farming possibilities with as much zest as on the fertile loams. Whole mountain ranges were burned off, though quite useless for farming. The attackers advanced upon the enemy with steel and fire - with quite as

much fire as steel. Burning down forests by deliberate intent was one of the quickest means of advance, for in a wind fires sometimes spread at sixty miles an hour.

There seems to have been no sense of waste in those days. Often enough they did not stack the logs for later use - it was easier to get them out of the way by burning them at once. Thus it is told how, in the neighbourhood of Michigan, huge slabs of white pine were dumped into the open fields in great pyres and burned day and night, - with such a blaze that there was no darkness in the town. Such pyres were sometimes kept burning for two or three years.

It can be seen from the above that at first the lumber trade was of less account than the actual business of clearing the ground for cropping. But the steady growth of mill-power at length made the lumber merchant very rich and powerful. When we realize that the first water-power mill in 1631 could only cut 1,000 board feet a day: that in 1767 the gang-saw cut 5,000 a day: that in 1820 the circular saw cut 40,000 a day: that in 1830 the steam saw cut 125,000 a day: and that the figure is now 1,000,000, we can appreciate what the lumber industry began to mean, and with what ruthlessness the Lumber Kings would ravage their way through the trees with an even greater recklessness than the farmers. Forests once covered six-sevenths of the State of Wisconsin with hemlock and pine, and by 1899 the lumbermen, employing 1,033 saws, were cutting 34 billion feet a year, until in 1932 there was nothing left. We may fairly call these lumber merchants tree-butchers since wood bore no more relation in their minds to the living object than slabs of meat are related to an animal in the eyes of the butcher. The trees were not trees but dollars in terms of "timber" to be translated by the marvellous ingenuity of man into all the things, the endless things, required by civilization.

One of these things is paper. Perhaps it is when we turn from

the saw mills to the paper mills of the factories in the towns that we get the clearest picture of such transformation. Let me bring the story up to date. An average issue of the Sunday New York Times of ninety-two pages, plus book supplement and magazine pages, requires one hundred acres of forest for its production. Some American Sunday papers run to one hundred and twenty-eight pages and have a circulation of one million. This requires the pulp-wood production of one hundred and forty acres for each issue. Since this means the consumption for each issue, of one thousand one hundred and twenty cords of pulp-wood, the operation demands the use of fifteen thousand, six hundred and eighty trees. That a space of one hundred and forty acres should be needed for a newspaper edition, is difficult to believe; so we must accept it as a fact that every Sunday when an American family open their weekly newspaper, they are entitled to say, Here goes another fifteen thousand trees.

How can re-afforestation possibly keep pace with this?

THE TREES REPLY.

Have we something to fear? Until recently we did not think so, and the Americans certainly did not think so. But now Nature has made her reply and shown her hand. At the moment civilization is still holding up large portions of Europe as well as itself. Let us see just what it has to stand upon now. In 1630 the land offered 820 million acres of forest, 600 million acres of grassland, and 430 million acres of open woodland. Today it is calculated that not more than one-tenth of the forest remains and that the annual loss exceeds the annual

growth by over fifty per cent; and it is calculated with regard to the soil that one-half of the fertility of the continent has been dissipated. That is to say that though there has been great loss of soil there is still a great acreage remaining. For we must recognize that a continent of that size whose soil has been built up through millennia cannot be utterly destroyed for some time, however enlightened and progessively mechanical the attackers may be. Nevertheless what has happened is sufficiently impressive.

The first thing, we have seen, was the attack on the trees. They came down. They were very valuable when alive and standing, they were grips, they were stakes, they were sponges - the twigs, leaves, rotting logs, pebbles, and stones at their feet serving as a filter and retarder of floods. They were mowed down and the ground was ploughed - that is loosened - where they had stood. That is the first thing. Then the tiny trees came down. I mean the grasses, for in relation to the soil they might be called little trees, as they also keep it in place by their root-grips and wind-cushioning stems. They also were attacked, mown down and ripped up by speedy mechanical means, and prairie fires were lit that rivalled the conflagrations of the woods. Those were the two main movements in the subduing of the wilderness.

And they were the two main causes in the erosions that followed. At the very moment when the pegs were taken up the carpet was cut into pieces. It was exposed to wind which first having dried it could then blow it away. At other places, exposed to unchecked torrents of rain, it could be washed away. The details concerning this have been rehearsed over and over again by the experts on the subject. We need but to remember a few salient facts. Nitrogen, phosphorous, potassium, and sulphur, are four of the most important ingredients in the soil. In a virgin land they have been built into it through centuries of undisturbed give and take in the diurnal round. They are so

light and insubstantial as to be defenceless if exposed to wind or flood. Thus bare ground turned by the plough can lose as much fertility in ten years as unbroken prairie in four thousand years (which also forms even as it goes). Consider the irreplaceable network of filter and sieve which we call roots. Remove them and the result is that water simply messes up the clay and the sun bakes it into chunks which are shifted into the valley by the next shower if the land is on a slope - while the unpercolating water rushes as from a roof, carving a gully in its passage. On a steep field a pouring thunderstorm will let loose up to four hundred tons of water per acre per hour - all of which could be successfully channelled if cushioned by trees. Without resistance four hundred tons of water can make itself felt and leave its mark. A piece of land in Georgia which was forested and calculated as having lasted for 35 thousand years, was uncovered and showed signs of disappearing in 25 years.

BRAZIL: AMAZON FORESTS.

One third of the world's trees grow in five million square kilometres of the Amazon basin , an area larger than Europe. It extends over half of Brazil. It is shown as blanks on the map between the veining of rivers and has little legend and no history.

In Brazil, about a quarter of the forests of the Amazon Basin and Mato Grosso have already been destroyed. Eleven million hectares of trees have been cleared in the preceding decade alone, and it became a matter of simple arithmetic, if this were allowed to go on, to forecast a date when the forest would cease to exist altogether.

Most of the clearing was done by foreign enterprises such as Daniel Keith Ludwig's Jari Forestry and Ranching Company, the Italian firm Liquigas, Volkswagen do Brazil, and King Ranch of Texas. These and many more had been encouraged in their attack on the forest by financial incentives offered by the Brazilian Government. Great fires - some of them ignited by napalm bombing - raged all over Amazonia, consuming trees by the hundred million, and for months on end travellers on planes on their way from Belem to Manaus or Brazilia saw little of the landscape beneath them through the smoke.

There were few parts of the world left in this century where uninhibited commercial adventures of this kind were still possible, where land could be picked up for next to nothing, wages were about a tenth of those paid in Europe or the US, and a modest investment in stocks and equipment offered the prospect of spectacular profits. The government's early enthusiasm for the giant ranches began to falter when it was found that, like thetrees they replaced, they seemed to live on themselves, and produced little surplus to help with the

balance of payments. Nor did they relieve unemployment, because when a ranch became a going concern it took only one man to look after 1,000 head of cattle.

With the growing suspicion that the multinationals were little concerned with the long-term problems of the nation, voices were raised to inquire whether this rape of the forest, so apparently devoid of economic reward, might not in the long run have some undesirable effect on the climate. The mild obsession, familiar in northern latitudes, over the possibility of the return if the Ice Age is replaced in the tropics with a conviction that the reverse is likely to happen. In Peru a loss of permanent snow has been recorded from the Andean ice-peaks. Bolivia has suffered from declining rainfall and searing winds, while in Brazil itself parts of the north-east in the area of Ceara have been reduced to near-desert.

SCIENTIFIC RESEARCH:

These misgivings were given alarming substance by the publication of figures based on 17 years' field studies in Amazonia. This research was done by Harald Sioli, Director of the Max Planck Institute of Limnology, in West Germany, and his calculations showed that the Amazon forest contributed through photosynthesis 50 per cent of the world's annual production of oxygen. He argued that it could not be sacrificed without a dramatic if not fully predictable deterioration in world climate. He calculated that the forest contained about 300 tons of carbon per hectare, and that its total extension of 280 million hectares, if burnt down, would allow sufficient carbon dioxide to be released into the atmosphere to cause a 10 per cent increase of the gas. The threat was two-fold; the loss of the forest's important contribution of oxygen, and of its capacity to absorb carbon dioxide. Sioli noted that the burning of fossil-fuels had already caused a 15 per cent increase in carbon dioxide over the past century, and that the forests were failing to contain the increase. He concluded that destroying the Amazon forest would be like getting rid of one of the world's major oceans - environmentally suicidal.

There has been some scientific bandying of arguments over these figures, which have been wholeheartedly endorsed by some experts and received with caution by others. One climatologist, for example, has argued that one third of the carbon dioxide released by burning fossil-fuels remains in the air, while another believes that the proportion is two-thirds. These are matters for discussion by the illuminati. On the danger represented by oxygen reduction, Dr. Mary NcNeil, an American specialist in laterite soils, says that were all tropical forests - of which the Amazon forest is a major component - to go, the earth's atmosphere would soon be denuded of oxygen.

To turn to the other problem of the excess of carbon dioxide, Norman Myers, a consultant in environmental conservation wrote in New Scientist, last December, 'Widespread deforestation in the tropics could lead to increased reflectivity of sunlight in the equatorial zone (the "albedo effect") and to a build-up of carbon dioxide in the earth's atmosphere. Both these processes could upset global climatic patterns....'

Enear Salati, professor of physics and researcher in agriculture at the University of Sao Paulo, was quoted in Critica of Manaus as saying that the destruction by burning of the Amazon forest, and consequent increase in the carbon dioxide content of the atmosphere, could result in heightened world temperature, the melting of the polar ice-caps, and a sufficient rise in ocean levels to bring about the inundation of hundreds of coastal cities throughout the world.

The predictions of all these experts are deeply worrying in their various ways. It seems clear that the least we have to fear from the loss of the Amazon forest is undesirable meteorological changes, and the worst is the catastrophe promised by Sioli and Salati.

The threatened forest offers the paradox of an area into which is crammed the greatest abundance and diversity of living things to be found anywhere on earth, yet is potentially a desert. Only the thinnest skin of humus covers the laterite floor. Apart from what is derived through photosynthesis, the trees live almost by what can be described as self-cannibalisation , upon nutrients furnished by the litter they themselves provide, made rapidly available through the action of insects, worms and fungi. The forest recycles 51 per cent of the rain that falls on it, and produces little more energy than it consumes. It lives then, almost independent of the soil, in a state of equilibrium.

Remove the trees and the average temperature of the area where they once stood increases by 30°F., rainfall declines sharply (by five per cent per year over the last 10 years in some areas recently deforested in neighbouring Bolivia), yet flooding becomes a recurrent hazard, because with the loss of the 'sponge effect' of the forest's root-mat, the soil can no longer contain the excess of water. With the rains, such nutrients as the forest floor contained are instantly washed away, and the laterite, laid bare to the sun, oxidises and loses every trace of fertility. This is no equatorial replay of the slow process of the formation of dustbowls in ruined, US prairies: this is instant desert unless immediate and costly counter-measures are taken.

In only one year, 1975, Amazonia lost four per cent of its trees, and scientist Harald Sioli said that if the rate of destruction was not slowed down, nothing would remain of the forest by 2005. It was a sum that people could do in their heads, but the conclusion was one that few could bring themselves to accept on the grounds that 'the authorities'- that disembodied but relatively intelligent force set between them and God - would never be stupid enough to allow this to happen.

In Manaus, capital of Amazonia, the weather provided evidence of secondary inconveniences to be expected as deforestation progressed. It had been raining torrentially off and on for some weeks, and could be expected to go on doing so for at least a couple of months. The Rio Negro, on the banks of which the city is built, was rising at the highest rate ever recorded: 7.5 centimetres a day. The Hydrographic Service was able to predict at this stage the strong possibility of a repetition, by the middle of February, of the floodings of the past three years, when the city's centre had been under water. The news from the Manaus-Cuiaba highway was that 600 lorries were stuck in the mud without hope of immediate rescue, filling the air with the stench of their decaying cargoes of food. Such floods, occurring at rare intervals

in the past as a result of freak weather, are now coming to be accepted as a normal feature of the rainy season, lending weight to the theory that they are caused by the forest's loss of capacity to absorb water.

There is no country where the problems of conservation are so earnestly and endlessly discussed as in Brasil, no country where intentions are better and the determination stronger to protect a national heritage - in this case above all the Amazon forest, and all the life it shelters. The furious outcry provoked by the alleged proposal to hand over 40 per cent of the forest to foreign companies makes it seem unlikely that this will be allowed to happen. What is more probable is that after the clamour subsides things will be found to be drifting along much as before, with a million acres of forest quietly snipped away here and there, worse flooding year by year, and yet another increase in such diseases as malaria (known to be aggravated by forest disturbance).

Meanwhile a new threat to the existence of the forest is about to develop - this time one that is far more likely to bring about the final solution. The appetites of the big ranching concerns have been to some extent held in check by the pressure of Brazilian opinion, but the assault on the forest to come is likely to engender less opposition, as reflecting an urgent national need.

Two barrels of petroleum substitute can be made from a ton of wood, and the Amazon forest is estimated to contain 415 billion cubic feet of timber. Ethyl alcohol and methane, commonly substituted for petrol during the last war are now being produced more cheaply from vegetable matter. Technical difficulties which were hampering Amazonian production in the past have been overcome, and with the increase in petroleum prices, substitutes are about to come into their own. Data

Shell have mentioned an expectation of increased production in the Amazon region.

These are ~~still~~ ALL the facts one really needs to know in deciding for oneself whether or not the trees will still be there in the year 2000.

CONCLUSION.

Trees are necessary to our existence because they are the chief guardians of the soil, keeping it stable and watered. In the very ancient past, trees were thought to be spirits or the habitation of spirits, both good and evil, and finally were conceived as simply deities who were the guardians of fertility. This climate of thought lasted for some centuries in every country and led to a very widespread worship of trees and to an equally widespread fear of injuring them. We call it the Era of Mythology. This way of thinking gradually broke up and we entered the Era of Economics when trees and everything else were valued in cash. At the height of this economic era the application of science showed how swiftly and completely men could make use of trees in particular and nature in general. Have we just reached the end of that period, having found that such an attitude has brought us to the edge of disaster? Are we about to enter what might be called the last act of the drama, when science now discovers precisely in what way trees really are the guardians of fertility after all. Could this be the Era of Ecology - the science of achieving an equilibrium with the environment. Having come full circle are we back at the beginning again? Is it too late to make a fresh start? The world is not what it was at the beginning of the story. Half the wealth has gone. Even so, we could save the situation. But are we sufficiently alarmed to mend our ways?

There is this to be said about man. He learns from history. History is experience. When we put our hands in the fire, we learn never to do that again. If the experience is painful we learn and we act. Already the Americans are learning. They are taking steps, if still haltingly. Having nearly destroyed themselves by their exertions they may save Europe and Latin America by their present example. They are soil-erosion conscious as no nation has ever been before. They know what they ought to do. They have experienced a sufficient amount of

calamity to make them act. Man must have calamity, he must have disaster, before he can save himself.

We have followed something of this drama. We cannot pursue it to the end on paper, for the last act has not yet been played. The climax may have been reached but not the denouement. There is another act to go. Since we are the players, what happens depends on us.

BIBLIOGRAPHY.

Johnson, Hugh, — The International Book of Trees, 1973, Mitchell Beazley Ltd.

Beazley Publishers, — The International Book of Wood 1976, Beazley.

Marshall Cavendish Ltd., — Family of Man, (Encyclopedia) 1974, 1978 Collier/Searle.

Lewis Norman, — Observer Supplement, April 1979 Observer Newspaper.

Collis, JS, — The Vision of Glory, 1972, Penguin.

Bates, H.W., — The Naturalist on the River Amazon, 1930, E.P. Dutton, N.Y.

Jeffries, Richard, — The Wood from the Trees, 1945, Pilot Press.

Philpot, JH, — The Sacred Tree, 1897, Macmllan.