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NATURAL ENVIRONMENT

INTRODUCTION

The fifty years since 1934 have seen the emergence of many new community attitudes towards the natural environment and its conservation. This Chapter contains an outline history of the nature conservation movement in Victoria followed by sections on significant institutional developments connected with the natural environment. It also includes sections on the contribution of the Australian Bureau of Meteorology whose headquarters are located in Melbourne, and Antarctic exploration which was directed for most of the fifty years from Melbourne. Since 1962 (with the exception of the special edition in 1973) the first Chapter of each edition of the *Victorian Year Book* has contained a special article on the environment in two series: Victoria's physical environment (1962 to 1975) and Victoria's environment and man (since 1976).

NATURE CONSERVATION MOVEMENT

Background

Conservation is not a modern phenomenon and an understanding of it goes back well beyond the last fifty years. The expansion of cities in Victoria after 1850, the development of agricultural irrigation in the 1880s, and the droughts of the 1890s all emphasised the need for reliable water conservation; subsequent problems of siltation in reservoirs and channels was soon traced back to soil erosion in the catchments.

Indeed, as far back as the late 1920s the Victorian Branch of the Australian Natives Association already promoted public and political awareness of the interrelationship of soil, water, and forests. Even before the Hume Dam was completed, the Forests Commission was worried by "excessive ... clearing ... at the heads of the highland catchments" and in 1936 urged "immediate steps ... to determine the optimum use of all land throughout the State". Also, in the following year the Australian Natives Association sponsored a major scientific symposium on the subject and published *Australia's Grave National Problem, Soil Conservation.* The Victorian Government formed an Erosion Investigation Committee which concluded that "most erosion can be attributed to the mistreatment by man of the soil and other natural resources in his endeavour to collect the greatest return in the shortest time ..."

From 1934 to 1939

Public awareness of the problem grew in the 1930s. Thus the Australian Forest League regarded as "distinctly objectionable" two Parliamentary Bills of 1937. One would have curbed the Forest Commissioners and Water Commissioners who "might feel bound to oppose settlement ... where it would ... result in erosion, flooding and siltation". The other Bill would have increased settlement on high quality forested lands. However, the League did not object to a third Bill for the removal of about 400,000 cubic metres of pulpwood per year from the Yarra and Thomson River catchments because the old Mountain Ash and young Ash was "second grade timber, unsuitable for saw-milling". Significantly, the Forest Commissioners at the time suggested — with some foresight — that "a forest conscience within the community [could be stimulated] through the

development of the recreational use of the forest estate". Forty years later the success of this very idea would make decisions about removing pulpwood much more difficult.

The Forest League in those years comprised public figures, politicians, professional foresters, and representatives of commerce and industry and could resolve many problems by discussion within its own ranks. Contentious issues included the cleaning and thinning of inflammable "waste" from forests; the logging of water catchments; alienation of forests for agriculture; grazing in forests and "spoliation of our fern gullies". Most problems were viewed in simple terms of the need to save the three great economic resources — soil, timber, and water.

In 1935 another body, the League of Youth, issued a Handbook aiming to win public support for governments "to carry out the policy and work necessary to make Australia safe for all time to come and its heritage of beauty and loveliness secure". The League planned to work mainly through the schools but, with no clear idea of the processes by which its high ideals could be attained, it wasted away within a decade. On the other hand, the Gould League of Bird Lovers had already been founded in 1909 with the simple idea of instilling in every child a love and respect for birds, and had continually increased its scope and adapted its methods to accommodate new ideas of conservation and education.

The role of education in conservation has been a recurring theme and numerous avenues have been explored. In 1935, a Native Fauna Section was set up in the Melbourne Zoo "with the aim of building up an educational institution to popularize and thus help in the protection of native creatures". An education officer was not appointed until 1969 but by 1982 there was an education staff of 15.

Many writers, photographers, and artists contributed to a popular interest in natural history and conservation ideals and in 1938 there appeared *Wild Life — Australia's Nature Magazine* which together with radio talks and innumerable public lectures, was to establish the editor, Crosbie Morrison, over the next 15 years as the greatest educator and publicist for nature conservation Victoria has known.

At the time, many amateur naturalists frequently expressed concern about such matters as grazing in national parks, lack of adequate protection for wildflowers and birds of prey, the felling of trees along highways, and the effect of decentralisation policies on "the bush". They were very conscious of a lack of precise and systematic knowledge of flora and fauna and in the absence of any better solutions to their problems they often suggested more restrictive laws and harsher penalties. However, a more positive approach, even in the absence of detailed knowledge, was to set aside areas of natural bushland where it was assumed nature would flourish. A National Parks Association had already been founded in 1908 but lapsed with the advent of war in 1914. Its ideals were preserved by individuals and specialist committees within the Field Naturalists Club and the Town and Country Planning Association.

Above all, the devastating fires in January 1939 revealed the vulnerability of the community's basic resources, and a Water Commissioner, H.H. Hanslow, used public and political pressure to force the Victorian Government to set up a Soil Conservation Board in 1940. This move may well have been helped by a symposium on conservation organised in 1938-39 by the Surveyor General, C.T. Clark, and attended by representatives of many professional organisations. Its proceedings were subsequently published.

From 1939 to 1945: the Second World War

The shock of the 1939 fires was expressed in Judge Stretton's classic report and had an important effect on the thinking of J.S. Turner who had come to take up the Chair of Botany at the University of Melbourne in the previous year. Turner was a plant physiologist by training who duly became a plant ecologist. The experience of Black Friday convinced him that the more scientific management of the environment would come from a better understanding of plant ecology. Over the next four decades he was in the forefront of many conservation assessments and battles both in Victoria and other States.

The Second World War overshadowed many domestic problems but actually emphasised the importance of soil, forests, and water in the national economy. The war also publicised the achievements of modern applied science and technology and created new expectations of the role which the newly emerging "ecologists" could play in conservation.

In 1944, the Save the Forests Campaign was founded and a council elected representing 30 member organisations with over 100,000 members. Two years later it had 51 member organisations, all concerned in some way with rural life. The Campaign produced press articles, radio broadcasts, information leaflets, films, and slide shows. It contacted Members of Parliament and municipal councils and issued a booklet *Victorian Forest Facts* to help speakers and writers. In the mid-1940s, the Forest League urged the inclusion of forestry in the school curriculum and the Save the Forests Campaign requested the Victorian Government to set up 50 forestry camps where secondary school boys would spend three weeks a year to "train up a new generation that from love of the good earth and knowledge of the issues involved, will conserve our most valuable asset — the Forests", but neither scheme was adopted. Towards the end of the war, there was a report by the Rural Reconstruction Commission and this strongly endorsed the need for better decision-making about land-use.

There were further serious bushfires in 1944. The lack of a co-ordinated approach to the protection and management of soil, water, and forests was again emphasised in 1946 by the Royal Commission to inquire into forest grazing. Judge Stretton described the three resources as an inseparable trinity: "If one is injured, the three must share the injury". His most far-reaching recommendation was that a land utilisation authority should be created charged with the duty of protecting all land. Effective legislation was finally passed in 1949 to set up both a Soil Conservation Authority (which replaced the Soil Conservation Board) and a Land Utilization Advisory Council. The first meeting of the Council recommended that the Authority should determine the proper use of all land in the catchment of the Hume Reservoir. Over succeeding years the Soil Conservation Authority was to play a decisive and prolonged public role in alerting the community to the serious dangers of erosion and the need to prevent it. Under the leadership of R.G. Downes new techniques and approaches were brought into service to achieve this end.

From 1945 to 1955

After the war ended in 1945 (the same year as the Dunstan Country Party Government was defeated), many conservationists in Melbourne and Geelong became more preoccupied with problems associated with urban growth and industrialisation. There had already been several schemes to plan and limit the growth of Melbourne and surround it with a Green Belt, and a new metropolitan planning scheme was introduced in 1949.

Also, after 1945, government agencies employed more graduates in forestry, biology, and agriculture, but naturalists perceived the need for a more co-ordinated survey of the State's biological resources and wanted better use made of the clubs' own "devoted but unorganised enthusiasts". As conservation matters assumed more political consequence, some of these professional scientists were reluctant to become too closely associated with the amateurs. Club members for their part felt that many government scientists were hindered by official policies, and opportunities for co-operation were not generally sufficiently exploited.

In 1946, the National Monuments sub-committee of the Field Naturalists Club was reconvened, and Crosbie Morrison and J. Ros Garnet organised a conference which set about compiling information on existing parks and devising a clear policy on park development. Garnet in 1949 saw "National Reserves" as places where the traditional skills and aims of the field naturalist and professional ecologist would meet. The Town and Country Planning Association was proceeding somewhat independently but on similar lines and separate reports from the two organisations attracted wide public interest. In 1953, a new National Parks Association was formed which continued to present evidence to the Victorian Government in favour of a properly administered system of parks. However, it was not until 1956 that a National Parks Authority was established consisting of the heads or senior representatives of land and resource management departments, tourism, and community interests in fauna and flora, parks, and skiing. Morrison was appointed first Director of National Parks, but his death in 1958 was a serious loss to conservation in its broadest sense.

NATIONAL PARKS: VICTORIA, 1956 to 1982

Year *(a)*	Number of parks	Area *(b)*
		(hectares)
1956	13	127,300
1961	16	130,000
1966	18	150,100
1971	23	205,900
1976 *(c)* —		
National parks	25	226,300
Other parks	14	57,400
Total	39	283,700
1981 —		
National parks	28	497,600
Other parks	30	298,700
Total	58	796,300
1982 —		
National parks	30	685,800
Other parks	33	299,300
Total	63	985,100

(a) At 30 June.
(b) Areas to nearest 100 hectares.
(c) Second category "Other parks" introduced into the National Parks Act in 1975.

The Save the Forests Campaign always stressed the relevance of its activities to soil and water conservation. The influence of ecology on resource management also made it clear that no one resource or small group of resources should be considered in isolation from others. The Campaign, therefore, extended its scope and was reconstituted as the Natural Resources Conservation League in 1951.

From 1955 to 1965

In 1955, the new Bolte Government embarked on a policy of industrial and commercial development but the Premier was also well informed about conservation. He was a successful farmer and Minister for Water Supply in 1949 when he introduced the Soil Conservation and Land Utilization Bill. He was a keen hunter and resolved the protracted problems with national parks legislation. The harvesting of living resources is one of the most contentious aspects of conservation planning, and hunting in particular has always been controversial.

A decline of game birds in the 1950s was seen by many as due to excessive harvesting. Others recognised it as due to loss of habitat. In 1958, the Victorian Field and Game Association was formed to work for the protection of wildlife habitat, game management, and a more disciplined approach to hunting. Members sought the provision of water for wetland management and a game licence fee to be used for wildlife conservation generally. They worked closely with politicians and government departments and took up some of the initiative which the naturalists had lost. In 1959, the Premier established a Wildlife Reserves Investigation Committee representing Departments of Water Supply, Forests, Soil Conservation, Lands, and Fisheries and Wildlife.

Morrison's nature magazine — *Wild Life* — ceased publication in January 1954; it had combined popular appeal and scientific accuracy. However, the Natural Resources Conservation League launched its quarterly magazine *Victoria's Resources* in 1959. Invited articles from acknowledged experts created an authoritative journal which proved a valuable education medium.

In 1937, the Forests Commission welcomed "a growing appreciation of the beauty and charm of the native flora and fauna ..." and recognised that "the forests belong to the community and have to be administered with a view to procuring the maximum benefits for the greatest number of people". However, in 1952, after the disastrous fires of 1939 and 1944 and the war, reconstruction of the timber industry became the prime concern and a statement of policy sounded more prosaic and single minded: "(a) protection, conservation, development and utilisation of the State's indigenous hardwood resources.

(b) the creation and maintenance of an adequate area of softwood plantations". The only concession mentioned was that water conservation would be considered in forest management planning.

The same utilitarian view of forests was held by the State Development Committee which from 1957 to 1960 investigated the utilisation of timber resources in watersheds, even though by then the idea of multiple use of public lands was in vogue. The Committee said, "the aim of management of any forested catchment should be to obtain the maximum productivity of both water and timber". However, the Board of Works continued its traditional policy of excluding commercial logging from catchments and twenty years later some of its reserves would be recognised as the last extensive forests near Melbourne in almost natural condition. The other commercial aspect of forest use, the clearing of native forests for pine plantations, provoked adverse public reaction in the 1960s.

In 1957, the Forests Commission already had 14 reserves for conservation purposes other than timber production and established its first Forest Park specially for recreation. An Environment and Recreation Branch was set up in 1970 and by 1981 there were 16 Forest Parks and 103 other reserves under the Forests Act.

Environmental concern for pollution was voiced soon after the war. Fishermen and naturalists complained about industrial effluents in Port Phillip Bay in the early 1950s and the *Health (Amendment) Act* 1954 dealing with stream pollution and the *Clean Air Act* 1957 reflected increasing concern for human health. Traditional rabbit poisons had long been regarded by naturalists as a serious danger to native fauna and new synthetic pesticides such as Dichlorodiphenyltrichloroethane (DDT) in the 1940s and Sodium Fluoroacetate (1080) in the 1950s revived concern. As a result of representations, an interdepartmental committee was established in 1960 to advise the Department of Agriculture on technical problems associated with the use of many new pesticides.

Two years later Rachel Carson's book *Silent Spring* portrayed the problems in a new light. The book had a world wide influence and described how cheap toxins made it economic to spray vast areas even if only an infinitesimal proportion of the chemical was actually involved in killing the pest. The rest was absorbed into soil and water, settled on plants, blew about in the air, was absorbed through skin and lungs, or ingested with contaminated food. The chemicals were designed to be poisonous. The ecologist's idea of an integrated world with interdependent components was brought home in a startling new way.

Carson's book elicited repugnance for the idea that unbridled technology, spurred only by economics, could lead to wholesale poisoning of natural systems and it had an important influence on conservation in the 1960s and 1970s. Further concern resulted in a Committee of Inquiry being set up in 1964 to examine the overall problems of pesticide use and one result was the appointment of a permanent Review Committee to provide continuing advice on the use of pesticides in Victoria. The problem of pollution was to attract even more attention in future years.

From 1965 to 1975

Victorian society in the 1960s enjoyed increased and hitherto unattained standards of affluence, leisure, educational standards, and scientific and cultural awareness. Thus, in 1961, the Royal Society of Victoria held the first of ten major symposia on the natural history of the State. Over the next 16 years they contributed to the growing interaction between traditional scientific disciplines.

Studies of soil, water, and minerals did not quite fit into the biologists' concept of ecology and the word "environment" was now used more to suggest the interdependence of all the components of natural systems which needed conserving. Thus, in 1965, R.G. Downes, then the Chairman of the Soil Conservation Authority, and later to become Victoria's first Director of Conservation, warned that too many so-called conservationists were concerned only with one particular resource. He felt that irrational extremists were causing confusion and he advocated more environmental education so that the community could understand the conflicts implicit in the use of different resources and how such conflicts could be resolved. Victorian Jaycees held a conference in 1967 on "Conservation — design for living in our environment" and A. Dunbavin Butcher, then Director of Fisheries and Wildlife, told them: "we must protect the integrity of the environment ... it

is the limited thinking of people who try to identify conservation with one isolated activity ... which could finally negate all the efforts of the conservationist".

This was to be the decade of environmentalism but over-use of the word deprived it of any precise meaning and much "environmental education" in colleges and schools had little to do with an holistic approach to conservation. However, the establishment of Monash University in 1961 enabled Professor A.J. Marshall, who occupied the foundation Chair of Zoology, to reawaken academic interest in the Victorian fauna and its ecology, and this in turn led to a postgraduate degree in Environmental Science from 1973.

At the secondary school level, the Natural Resources Conservation League published *Man, the Earth, and Tomorrow* for secondary schools in 1969; two years later the Environment Studies Association was formed to encourage field investigations; and the Gould League broadened its scope and introduced the publication *Survival* in 1972. The Environment Teachers Association was formed in 1977 to promote an interdisciplinary approach.

Many engineers, architects, and planners now appreciated that their individual developments could not be pursued without regard for the natural context in which the work would be set, but there was a hint of defensive reaction in 1969 when the Town and Country Planning Association called its seminar "Conservation and Development — Who said you can't have both?" In the same year the Chief Justice of Australia, Sir Garfield Barwick, observed that "Probably no social issue has dominated [the] media recently more than the pollution of our environment".

The conservationists' traditional concern for soil, water, forests, and wildlife now shaded imperceptibly from polluted streams and beaches to such issues as industrial waste, noise abatement, visual pollution, and suburban streetscapes. Thus by 1964, there were about forty community groups in the State interested primarily in fauna and flora and about fourteen concerned with other aspects of conservation. In the next 10 years, some eighteen more fauna and flora groups emerged and at least thirty-nine new groups interested in other conservation issues. Although industrial and engineering enterprises had flourished, there had also grown an awareness of the "environmental" links between industry, international trade and politics, world population growth and poverty, the consumer economy, and pollution.

Many persons, especially young adults, expressed dissatisfaction in the 1960s with traditional values and "big government" by rejecting social conventions and adopting a simpler "life style". This accorded well with the conservation of material resources but it became difficult to distinguish genuine conservationists from others who used pseudo-conservation arguments to embarrass the Government or promote their own interests. These opportunists provoked much cynicism and reaction against conservation and in April 1969 the Natural Resources Conservation League convened a meeting of established conservation organisations to form a body capable of presenting a reasoned and co-ordinated viewpoint to the community and the Government.

Then an event happened which acted as a catalyst for the whole conservation movement. In May 1969, the Minister for Lands decided to develop virgin land for farms in the Little Desert and the Kentbruck Heath in western Victoria. The League mobilised the societies and at a meeting of the Save Our Bushlands Action Committee in August, 1,100 persons heard the Little Desert scheme criticised on scientific, aesthetic, ethical, and economic grounds. Strongly felt opposition which was reflected in the political parties, the public, as well as the media forced the Victorian Government to abandon the scheme.

In the midst of the controversy the Victorian Government introduced the Land Resources Bill but it lapsed when a State election intervened. For the first time, election policies stressed environmental issues. The Liberal Party, was returned to office with a reduced majority, and this was in part attributed to the emerging importance of conservation. Following this, it established the Land Conservation Council and the Environment Protection Authority (EPA) in 1970. The EPA became a significant and politically sensitive agency because of its close involvement with industrial development in such areas as air pollution, noise pollution, and emission standards. The Natural Resources Conservation League's plans materialised in June with the inauguration of the Conservation Council of Victoria, a non-official body representing 76 voluntary organisations. The lapsed Bill reappeared with many improvements and was enacted in 1970; it set up the Land Conservation Council

whose task it would be to recommend the future use of all public land in Victoria. This Council comprised a permanent chairman, the heads of eight government resource agencies, a primary producer, and two nominees of the voluntary organisations. The Land Conservation Council's clear procedures encouraged maximum public participation and many amateur organisations and individuals made major contributions. The National Parks Association published Frankenberg's *Nature Conservation in Victoria* in 1971 and Johnson's *The Alps at the Crossroads* in 1974.

Conservation problems were by now cutting across conventional departmental boundaries and in 1973 a Ministry for Conservation was established to bring together the Environment Protection Authority, Fisheries and Wildlife Department, Land Conservation Council, National Parks Authority, Port Phillip Authority, Soil Conservation Authority, and the Victoria Archaeological Survey.

Water pollution became the next area of environmental concern. A proposal in 1967 to discharge sewage into Port Phillip Bay caused fierce opposition. The Board of Works and the Fisheries and Wildlife Department studied the physical, chemical, and biological characteristics of the Bay and this developed into the first integrated ecological study of a major Victorian region. Others were to follow. In this case the Port Phillip Conservation Council and Environmental Research Associates criticised the inadequacy of plans to limit urban and industrial growth in the catchment.

The next area due for attention was Western Port Bay, where significant industrial development did not commence until 1965. During 1971, the Conservation Council compiled a record of features of significance within the catchment and major local industries contributed $400,000 to a $1.5m study from 1973 to 1975 before development proceeded under the direction of the Western Port Bay Regional Planning Authority and a Co-ordination Group representing local councils, industry, conservation groups, farmers, and government departments.

Other large developments came under increasing scrutiny. Trade union bans caused long delays and substantial changes to the building of the Newport Power Station after 1972 because of potential pollution; in fact, the project was finally reduced to half the size planned. Likewise environmental studies led to the re-siting of a proposed dam on the Mitchell River (1972) and the abandonment of one at Yarra Brae (1974). *The Environmental Effects Act* 1978 aimed to consider the effects of all such major works and "to give those with an interest in the proposal or who are likely to be affected by it, an opportunity to express their views".

During the 1970s, there was renewed concern about the familiar problems of soil and river bank erosion, land salting, tree deaths, and loss of waterbird and fish habitats. By then they were seen in a new light as symptoms of fragmented land and water management.

The *River Improvement Act* 1948 had set up local trusts to concentrate on local flood relief and erosion control, but with no responsibility for management of the higher catchments, beneficial stream values, or the effects of their works down river.

In 1952, Sir Ronald East suggested drainage authorities to manage whole catchments. The LaTrobe Valley Water and Sewerage Board was established in 1954 but a provision for similar river boards with jurisdiction over whole catchments was deleted from the Drainage of Land Bill in 1975. In the same year, a Standing Consultative Committee on River Improvement was set up, representing the Conservation Council of Victoria, The River Improvement Trusts Association, and six government agencies, but in 1981 the Public Bodies Review Committee favoured some more formal basis for the control or co-ordination of all water management on a regional basis.

Another controversial matter was the economic use of community resources. Forests, fish, and minerals are State-owned resources which can be harvested or mined for private profit, usually upon payment of a licence fee or royalty. By the 1970s, the voluntary organisations had developed professional and technical skills comparable with those available to government and could make sophisticated assessments of the effects of resource based industries. One of the most controversial was the supply of pulpwood to the packaging industry.

Much evidence was amassed and presented supporting claims that intensive forestry techniques would be needed to supply the timber promised to the industry; that this would have serious consequences for the native fauna and flora; that the industry consumed

much energy and caused serious air and water pollution; that the high capital investment would be used to justify increasing demands for raw materials to make possible industrial growth; and that royalties were set low as a subsidy to attract industry but did not compensate for the disadvantages and hidden costs borne by all Victorians. Public awareness about natural resources had been fostered by several State instrumentalities. For example, poor control of pulpwood operations in other States had caused visual and ecological damage and the idea that Victoria's trees should be converted into foreign wastepaper aroused widespread dismay. In 1980, the Forests Commission issued the draft outline of an environment effects statement for harvesting pulpwood in the Shire of Orbost and planned to conduct experimental harvesting in East Gippsland during 1981. Subsequently there was a looming argument on wood-chipping in the Otway Ranges. This debate had not been concluded by March 1983.

On the wider horizon, most Victorians had for many years appreciated national parks for their recreational amenities (even if naturalists expected more esoteric benefits). Most Victorians are city dwellers, and the relative affluence in the 1960s and early 1970s brought with it money, cars, leisure, petrol, and a vision of "quality of life". The Victorian Government's policy was to increase the area devoted to national parks. Thus the time became right for the Land Conservation Council to recommend an adequate system of national parks. This developed during the 1970s; in 1970, the National Parks Service administered 23 parks with an area of 200,000 hectares; by 1980 there were 55 parks comprising 774,000 hectares.

Since 1975

Dramatic rises in the price of fuels in the late 1970s created a new awareness of the need to use energy wisely, and the Conservation Council of Victoria sponsored a major review of energy conservation strategies in 1978. The late 1970s brought greater concern with the economic issues of recession, inflation, and unemployment. The apparent conflicts between conservation and development were symbolised by an aluminium smelter planned for Portland. In 1983, major issues were soil salting, forest management, and general land-use planning.

THE ROYAL SOCIETY OF VICTORIA

The year 1934 was the 80th anniversary of the formation of the Victorian Institute for the Advancement of Science and the Philosophical Society of Victoria. These societies merged in 1855 to form the Philosophical Institute of Victoria which in 1859, by Royal Assent, took the name "The Royal Society of Victoria". The Society's object, unchanged over the years, is "The Advancement of Science" which it has pursued by holding scientific meetings, by the publication in its *Proceedings* of scientific research, and by the maintenance of its library, which now holds about 25,000 volumes.

Membership of the Society, which has a general rather than a specialised scientific outlook, includes scientists in many disciplines in addition to many men and women in other walks of life who have an interest in scientific matters. In 1934, there were 200 members; this increased to 250 in 1947 and then to 650 by 1980. The Society's Hall, situated on land granted to the Society by the Victorian Government for scientific purposes in 1857 and bounded by Victoria Street, La Trobe Street and Rathdowne Street, was built in 1859 to the design of Joseph Reed. It was extended and remodelled in 1953 following an agreement with the Australian Regional Council of the Royal College of Obstetricians and Gynaecologists (now the Australian College) for tenancy of portion of the extended building and joint use of the Lecture Hall, Library, and Supper Room. The extensions were formally opened on 25 August 1954.

In December 1956, a Symposium on "Australia's part in the International Geophysical Year in the Antarctic" was honoured by the presence of His Royal Highness the Duke of Edinburgh, who presented 23 Polar Medals.

Until 1940, ordinary meetings of the Society were usually devoted to readings of research papers, but thereafter an increasing number of invited lectures, covering a wide range of subjects, was delivered. An important part of the Society's activities in recent years has been to arrange and publish a series of Symposia dealing with regions of Victoria, intended

to bring together the many aspects of scientific information on each geographical area and to stimulate further research. The regions covered have been the Victorian High Plains, the Basalt Plains of Western Victoria, the Victorian Mallee, East and West Gippsland, Bass Strait and its coasts and islands, Western Port Bay, the Otway Region, the Murray-Darling River System, and the Coasts and Continental Shelf of Victoria.

The Society's Centenary Year in 1959 coincided with the Centenary of the publication of Charles Darwin's *The Origin of Species.* A Symposium "The Evolution of Living Organisms" held in the Society's Hall was attended by distinguished scientists from Australia and overseas, and papers presented were printed in a special publication. A Centenary Monument was erected on the western boundary of the society's grounds in the shape of a granite boulder, a "glacial erratic", brought from Mawson, Antarctica, by the Antarctic Division of the Commonwealth Department of External Affairs; the inscription on it marks the Society's special interest in Antarctic exploration. The Governor of Victoria, Sir Dallas Brooks, unveiled it on 7 December 1959, and a silver medal, to be awarded annually for excellence in scientific research in, or on, Australia in various fields, was instituted at the same time.

The Philosophical Institute of Victoria had, in 1857, set up an Exploration Committee, which made arrangements for the Burke and Wills Expedition from Melbourne on 20 August 1860. The centenary of that occasion was marked on 20 August 1960 by the laying of durable wreaths at the Burke and Wills monument, which then stood in Spring Street, between Little Bourke Street and Lonsdale Street. These wreaths were later conveyed by air to Nappa Merrie homestead and laid at the memorial cairn at Cooper Creek.

ROYAL BOTANIC GARDENS AND NATIONAL HERBARIUM

Among the many gifts to the Government at the time of the Centenary of the State in 1934, the donation by Sir Macpherson Robertson of a new herbarium to the Botanic Gardens gave a great impetus to taxonomic botany. It enabled the transfer of the National Herbarium collections in the Domain with their irreplaceable Mueller material, to the Gardens, and made possible the amalgamation of these collections with the much smaller horticultural herbarium of the Gardens.

Within the Gardens proper, maintenance of W.R. Guilfoyle's concept has been rigidly followed, and since 1934 two matters of great horticultural importance have arisen. First, with many of the larger trees now exceeding a century in age, the inevitable signs of over maturity or senility are appearing. By 1983 this became apparent among the trees in the oak lawn, and while these species require several hundreds of years to reach maturity in their natural environment, the more attractive climate of southern Australia has brought them to maturity in a much shorter period.

Second, the greatly overcrowded environment of trees and shrubs along the southern boundary of the Gardens has resulted in an almost impossible environment as far as the native flora is concerned. With the upsurge in the cultivation of native plants in the last two decades, the demonstration to the public of desirable garden species has become most important. The Victorian Government in 1969 purchased, near Cranbourne to the south-east of Melbourne, an area of approximately 160 hectares of virgin heath country on which to establish a native plants annexe to the main Gardens in Melbourne. The Miss M.M. Gibson (Gardens) Trust, established in 1945, has taken over a great part of the responsibility of developing this project, by purchasing additional surrounding land to provide further soil types to that of the original land, and to act as a buffer against the intrusion of undesirable elements to the main site. The Trust has also committed itself financially to the development of the project.

On the horticultural side of the Gardens, the occurrence of three droughts in 1967-68, 1972-73 and 1982-83 brought to the fore the necessity of an adequate, reliable water supply. This was not a new problem — it had been encountered by all Directors since the foundation of the Gardens in 1846. Very early, water was pumped from the Yarra River but this soon became too saline to use; then Yan Yean domestic supply became unreliable; later the pumping of water from above Dight's Falls (where it was beyond tidal influence) held the situation under control until the reticulation pipes collapsed; and finally there was a return to the domestic supply, with its stringent restrictions during hot summers. An

electric pump installed near the reservoir in 1975 and replacement of the old reticulation provided adequate water under pressure up to the highest levels of the Gardens.

The provision of trained gardening staff is of greater importance to a Botanic Gardens than any other public park system. They are custodians of plants which, in many instances, have specific requirements for correct growth in pruning, watering, and fertilising. During the first century of the Gardens, many of the gardeners had had English training in the profession before coming to Australia, with the additional ability of being able to impart their practical knowledge to those with whom they worked. This experienced group of gardeners started to diminish in the 1950s and 1960s, and were not replaced. Gardening was declared an apprenticeship trade; this was followed later by lawn management, horticulture, and other branches of gardening. Garden training was commenced at Oakleigh Technical School and was proclaimed as a trade in 1966. This was later enlarged by the proclamation of nurseryman, turf, and landscape gardening trades. Although but a first step to providing relief to the Botanic Gardens, advanced training is planned later for those who, following the apprenticeship course, fulfil a stated period of practical experience enabling them to proceed to the advanced course.

In 1958, the approval by Her Majesty Queen Elizabeth II for the Gardens to use the title Royal, and become the Royal Botanic Gardens, gave considerable prestige to the Gardens, and resulted in closer links between the similar Royal Gardens at Kew in England, and Edinburgh in Scotland.

The greatest benefaction that came to the Gardens since 1934 was the setting up of the Miss M.M. Gibson (Gardens) Trust in 1945. In that year, Miss Maud Gibson formed a Gardens Trust with a sum of $40,000 in memory of her father, a prominent resident of Melbourne. The interest derived from this fund was to be used for the "maintenance, development and improvement of the flora in the Melbourne Botanic Gardens, or otherwise for the benefit of such Gardens". The success of the Trust so influenced Miss Gibson that, in 1965, she decided to form another Trust, the Botanic Gardens Branch Research Trust, the purpose of which was to conduct research work associated with the Botanic Gardens and the National Herbarium. She commenced this Trust with a gift of $10,000, to which she added considerable sums in later years.

The encouragement of publications and the growth of field work into native flora together with the much greater interest in the development of the Cranbourne Annexe, are examples of the types of useful work that can be conducted by such a Trust. In the main, the long-term benefits of the Trusts are that they act as "pump primers".

A survey of the visitors to the Royal Botanic Gardens carried out by the University of Melbourne in 1976-77 established an interesting profile of the persons who visited the Gardens. The mean age of adult visitors to the Gardens was 37 with 68 per cent ranging from 25 to 49 years. The mean age of a first visit was 12 years with 68 per cent ranging between 6 and 19 years. The sex ratio of adult visitors was 49 per cent male to 51 per cent female. Only 6.5 per cent of the adult visitors were not fluent in English. Forty-nine per cent of the adult visitors came from Melbourne suburbs that are not adjacent to the Gardens, 43 per cent came from adjacent suburbs, 4 per cent came from overseas, 3 per cent from interstate, and 1 per cent came from Victorian country areas. A related study showed that the number of visitors was approximately 1 million per year.

During the last two decades certain administrative decisions have affected the Gardens. First, there was a Parliamentary Inquiry into the Gardens in 1969 and this attracted considerable interest. Legal protection was mooted in May of that year in the report of the Legislative Council which quashed an entrepreneurial proposal to use part of the Gardens to build a licensed restaurant. In 1972, an appeal to prevent a "high-rise" building from proceeding on the residential perimeter to the Gardens led to the control of building heights to preserve the landscape quality and amenity of the Gardens through amendments gazetted on 15 September 1976 to the Melbourne Metropolitan Planning Scheme. National Trust protection in the early 1970s led to the classification of the Director's residence built in 1854 and the older lodge near "H" gate. The National Heritage Commission is proceeding to add the entire Botanic Gardens to the National Register.

The new kiosk, built on the site of the first kiosk destroyed by fire on 3 November 1970, opened in 1976. The old tea pavilion, on the verge of collapse, was demolished to make way for the new kiosk, but the remaining shelters in the Gardens have been fully

restored. Other restoration has included the removal of 3,600 cubic metres of silt from the eastern end of the Ornamental Lake in 1975; the de-silting of the Nymphaea Lake in 1977; the replacement of the fountain and placement of seven stones in the form of the "Southern Cross" as pedestals for living sculpture; the dismantling and re-fabrication of the Nareeb Gate; and the replacement of the fence commencing at the western end of Alexandra Avenue to prevent theft and vandalism. Paths and drains were also being renovated to prevent further silting of the lake and maintain healthy plant life.

The islands in the Ornamental Lake have gazetted names to commemorate persons whose craft skills have contributed substantially to improve the Gardens for the enjoyment of visitors.

A survey of the Gardens, made under the direction of the Surveyor General of Victoria between 1974 and 1976, and drafted at scales of 1:500 and 1:2000, led to the fine printing of a coloured, contoured plan of the Gardens for sale to visitors in 1980. This survey also made possible a complete horticultural census of the Gardens and provided information for better management, accurate labelling, and the education of visitors. The number of named species and cultivars growing in the Gardens by 1979 stood at 8,794 and is the only complete twentieth century listing of plants in any Australian botanic gardens. It is noteworthy that *Melaleuca ericifolia*, *Eucalyptus camaldulensis* by the lake, and *Themeda*, *Drosera*, *Bursaria*, and *Eucalyptus melliodora* on the ridge still survive from the days prior to European settlement. The most recent innovation is an "historic roses" garden established in 1978.

Further interest in the Gardens was achieved through exhibitions and shows held in the Herbarium in collaboration with the Royal Horticultural Society of Victoria since 1974.

Technological innovation in gardening has slowly accelerated. Patent one horse mowing machines boasted for lawn maintenance in the *Victorian Year Book* 1888-89 were in use until 1950 when the Gardens' horses were replaced by a tractor. The old gang mowers were replaced in 1976 by the first self-propelled fully hydraulic mower, complete with cutter, fertiliser spreader, and aerating equipment. Soil acidity and salinity have been controlled so that the lawn feature of the English landscape can continue to be appreciated by visitors who are still permitted to walk, sit, and picnic on these lawns. Durban grass, introduced from Adelaide Botanic Garden in 1977 is becoming established in the densely shaded soils where all other turf has failed.

The Gardens acquired new areas at Werribee Park and Cranbourne in the 1970s. The former was part of the redevelopment on the Werribee Park estate where a garden area, which will be the mature version of the designer's vision, is being recreated, and the latter has enabled the Gardens to initiate a new era in the development, display, and study of native flora.

Scientific work in the National Herbarium virtually ceased with Mueller's death in 1896, and an irreparable loss of records and equipment preceded the move in 1934 to the present building which was used by troops during the Second World War. Botanical work started again in the 1940s and the old Observatory was gazetted as the site for a new herbarium in 1979.

The plant collections of the National Herbarium and the library remain the largest and taxonomically most important single collection in Australia. By 1980, visiting botanists from interstate and overseas had increased to 59, and 92 Victorians visited the Herbarium to study and carry out research there. The demand for published, definitive taxonomic botanical studies has increased since 1955; this continues to be met by the journal *Muelleria*, published and distributed annually. The identification service provided by the Herbarium became popular; time spent on drug and forensic plants has more than doubled each year during the 1970s and reflects the dramatic increase in the use of these plants within the community.

A botanical illustrator, appointed in 1978, has provided much material for an illustrated flora of Victoria. Following the Matthew Flinders Bi-centenary Celebrations, an annual scholarship at postgraduate research level has been awarded to encourage the study, conservation, and appreciation of Australian flora.

Specialist skilled botanists, aided by the Gardens' first computer (acquired in 1974) have made possible floristic surveys of native plant communities and horticultural plants. These surveys have helped local government and statutory authorities, concerned over the quality

of the native flora for land management, and the quality of urban and industrial space, through gardening.

ROYAL BOTANIC GARDENS: CENSUSES OF PLANTS, VICTORIA, 1883 TO 1979

Census date	Number of genera	Number of species	Number of individual plants
1883	1,537	5,560	n.a.
1948 *(a)*	951	3,140	n.a.
1979	1,711	8,794	30,518

(a) Excludes nursery collections.

MUNICIPAL GARDENS

By 1934, there were many excellent municipal gardens in Victoria and almost without exception, they had been established within the concept of traditional English landscape design. A large number of towns and cities had some form of central garden built on similar lines to those of early Melbourne, such as the Royal Botanic and Fitzroy Gardens, and usually established on Crown land as the result of application from interested local community groups. Both the construction and maintenance of such gardens were the responsibility of British trained gardening artisans and the materials used were similar to those of their native land, despite the difference in climate and local flora.

This State wide movement was based on aesthetic values, and gardens were planned for passive use only. Sporting fields and playgrounds were treated as distinct amenities and the use of public gardens for such active pursuits was usually prohibited.

Between 1934 and the commencement of the Second World War, when Victoria was recovering from the Depression, municipal gardens attracted very limited public funds, but numbers of men were employed in government and municipal open space projects under the unemployment scheme of that period. While these men were not skilled in gardening, the large numbers available at no cost to the relevant authorities were able to contribute considerably to the development of several new parks and gardens, for example, the King's Domain and Shrine Reserve in Melbourne.

Because of limited finance and labour during the war and the years immediately following, there was a marked decline in the standards of municipal gardening. There was a severe shortage of skilled personnel since neither gardening nor horticulture were recognised as trades or technological disciplines. The British trained gardeners had retired and the majority of the young men who had entered the industry in pre-war years, on returning from the services, found more lucrative positions. Landscape architecture was not recognised and there was a general lack of appreciation of horticultural standards by the authorities. The cumulative effects were the deterioration of existing gardens, and mediocrity in the development of the many new municipal parks being established to meet the needs of a rapidly expanding post-war population.

In the 1950s, two factors emerged which had a significant influence on municipal open spaces. The first was keen interest in town planning with the associated allocation of minimum standards in the provision of parks, gardens and reserves, and in 1954, the enactment of the Melbourne Metropolitan Planning Scheme. The second was the advent of the shorter working week. This, together with more money for leisure activities, resulted in an increased demand for recreation facilities, with the emphasis on sports grounds and children's playgrounds. Thus, the majority of new municipal reservations was oriented towards active recreation, and gardening as practised in former years was largely neglected.

The next generation saw changes. Improvements in town planning and greater public awareness of their implications increased the provision of public open spaces. A 1966 amendment to the Local Government Act (section 569B, sub-section 8A) gave local government planning authorities power to acquire 5 per cent of all new sub-divisions or its equivalent value in money, and the 1956 legislation had already enabled the Melbourne and Metropolitan Board of Works to develop its metropolitan parks system of some 4,500 hectares in the outer Melbourne suburbs.

The Youth, Sport and Recreation Act of 1972 provided for the establishment of a Ministry which further emphasised the use of public open spaces for all forms of recreation.

Authorities came to employ landscape architects, who used the more sophisticated skills made available through the newly introduced apprenticeship in horticultural trade practices, and thus improved design in parks and gardens landscape. However, in contrast to the earlier English gardenesque planning, a new garden design concept had emerged with a distinctive Australian character, using mainly indigenous plants in natural settings.

With respect to the earlier gardens, a small group was classified as of significant historic value by the National Trust of Australia (Victoria). Nevertheless many have deteriorated, some now being used for recreation purposes. Those in Port Fairy, Kyneton, and Camperdown have become caravan parks.

In 1976, the Victorian Government launched the "Garden State" concept which sought to draw attention to and extend the importance of trees and gardens in Victoria. By the beginning of the 1980s, the acceptance of this concept as well as the growing community pressure for an improved quality of life helped amenity and environmental horticulture to flourish, and, after fifty years, new municipal gardens were being constructed, two examples being found in Doncaster and Greensborough. However, they were being planned as part of complete recreation parks systems and contain a large component of an Australian style landscape.

HORTICULTURAL EDUCATION

Prior to 1934, almost all the skilled horticulturalists and gardeners employed in Victoria were trained in Britain under a very comprehensive apprenticeship system operating in the large estates of that country. It was these artisans who, coming as migrants, supplied the skills to design, develop, and maintain Victoria's earlier gardens and establish plant nurseries to supply their needs. Few Australians were found in these fields, other than those descendants who carried on the family trade in both nurseries and in public gardens.

The only training school in Victoria in 1934 was the Victorian Department of Agriculture's School of Horticulture situated in the Burnley Gardens. This had been established in 1891 after the Victorian Government had taken over the control of the Burnley Gardens from the Royal Horticultural Society of Victoria. The original course was of two years full-time duration, leading to the Certificate of Competency in Horticulture, and until 1930, the majority of students were women, some of whom, such as Edna Walling, became well-known in the landscape design field in Australia.

In the early 1930s, efforts to increase the numbers of male students were successful, and from that period to the commencement of the Second World War, a considerable number of boys trained in the school, entered parks and gardens departments and other horticultural fields. However, despite this, gardening was not recognised as a trade, and during this period, as the flow of British trained migrants stopped because of the Depression, there was a dearth of qualified and experienced gardeners. Limited efforts were made by horticultural authorities to develop some form of gardening trade apprenticeship in order to improve the standard of horticultural practices, but nothing had been achieved by the commencement of the Second World War.

After the war, training in Victoria was still limited to the Burnley School of Horticulture, the number of students being boosted by its involvement in the Commonwealth Reconstruction Training Scheme. During the period 1946 to 1948, 102 ex-servicemen and women were trained in courses ranging from two to five terms' duration.

In the early 1950s, further moves to have gardening proclaimed as a trade were made. However, it was not until after 1966 that gardening, as carried out in municipal councils, racing clubs, golf clubs, foreshore trusts, and cemetery trusts in the metropolitan district of Melbourne, was proclaimed as a trade, and training instituted at the Oakleigh Technical School.

In 1971, turf management was added and the proclamation was extended to cover the whole State. However, in 1975, the Act was altered to include all gardening practices, and re-named to that of "Horticultural Trades", having four sections, namely, gardening, turf management, nurseryman, and landscape gardening. In 1979, a second apprenticeship school teaching the same subjects was established in Royal Park as an annexe to the Collingwood Technical College, serving the northern and western suburbs of Melbourne, and in 1981 "Flower Growing" was proclaimed a non-compulsory trade and a course was commenced at the Oakleigh Technical School.

Since 1971, apprentices from the country have been trained in the Melbourne centres under a block release system, and provision was also made for those persons over the age of 21 and working in horticultural trades, to obtain a trade certificate.

At the tertiary level, the school at Burnley was re-named the "Burnley Horticultural College" and the qualification upgraded in 1958 to a three year course with entry at Fifth Form level, leading to a Diploma of Horticulture. In 1967, the course was again modified to that of Diploma of Horticultural Science, and in 1980 entry was lifted to Higher School Certificate level or its equivalent, the qualifications being upgraded and re-named Applied Science in Amenity Horticulture and in Nursery Management. In 1983, this College was amalgamated with the five State Agricultural Colleges and became part of the Victorian College of Agriculture and Horticulture, which was administered under the Victorian Post-Secondary Education Act by a Council responsible to the Minister of Education.

In an effort to meet urgent demands, the Royal Melbourne Institute of Technology in 1965 established a course leading to a Graduate Diploma of Landscape Design. This was aimed at teaching diplomates and graduates from such disciplines as architecture, engineering, interior design, and horticulture, the fundamentals of landscaping and in 1982 this was replaced by an undergraduate course in Landscape Architecture. Further, in 1978, the Centre of Environmental Studies of the University of Melbourne established a graduate course at Master's level in Landscape Architecture, and in 1982 the Centre was absorbed into the new School of Environmental Planning.

HORTICULTURE AS RECREATION

A survey by the Ministry for Youth, Sport and Recreation established that in 1976 horticulture was the most popular form of recreation for 26 per cent of Victorians. The following table derived from information furnished by establishments which undertake the propagation, cultivation, or growing-on of nursery produce for sale, illustrates the increasing popularity of home gardening as a form of recreation:

NURSERY STATISTICS: VICTORIA, 1974-75, 1977-78, AND 1980-81

Year	Establishments	Area used for nursery activity (including covered areas)			Employment *(a)*			Wages and salaries paid	Total purchases	Total sales
		Total	Hot houses *(b)*	Shade houses *(c)*	Proprietors	Employees	Total			
	number	hectares	'000 sq m	'000 sq m	number	number	number	$'000	$'000	$'000
1974-75	355	952	187	151	n.a.	n.a.	2,004	n.a.	2,996	17,659
1977-78	321	933	317	137	633	1,301	1,934	n.a.	6,854	30,596
1980-81	437	1,624	384	192	902	1,798	2,700	16,668	10,290	49,367

(a) Includes both full and part-time workers and casual employees.
(b) Covered with plastic film, etc.
(c) Covered with shade cloth.

NATIONAL MUSEUM OF VICTORIA

Introduction

The Museum was established when the classic voyages of discovery were still being made. Species were considered to be independent entities, and the aim was to catalogue them all. There was a great interest in the species of animals, plants, minerals, rocks, and fossils discovered; the Museum was the place to exhibit them. Similarly, much interest was shown in the differing ways of life of the peoples of the world, and in the Museum exhibits showing the many kinds of artefacts manufactured by them.

While the changes in outlook took place gradually in the scientific world, the changes in approach to the Museum's work developed significantly under various directors and their staff. The activities of the Museum can be summarised as acquisition of collections; research on these collections to give them greater meaning; making the knowledge obtained available by exhibits, publications and school education programmes; and answering inquiries from the public.

Trustees

In addition to the Public Service organisation operating under the Permanent Head through the Director, Trustees are appointed by the Victorian Government to manage and

control the Museum. In 1934, the one body of Trustees supervised the four institutions in the complex of buildings occupying the block bounded by Swanston Street, La Trobe Street, Russell Street, and Little Lonsdale Street, namely, the Public Library, the National Museum, Museum of Applied Science, and the National Gallery. The title "National" survives from the time when Victoria was an independent Colony. In 1945, three separate groups of Trustees were appointed for the Library, the Gallery, and the two museums, and in 1950 the National Museum was given Trustees of its own.

Exhibits and education

Until the end of the 1930s, the Museum was chiefly interested in cataloguing the species of the natural world and classifying them. After the war the exhibits were refurbished and this gave opportunity for the new ideas to find expression. The development of a science of genetics made it clear that living species have a dynamic relationship with their environment, so there emerged the new science of ecology. However, in 1934, the word "ecology" had still not appeared in the Shorter Oxford Dictionary. In the leading museums of the world, the new approach to natural history found its expression in the true to life diorama — the explicit reproduction of samples of the environment illustrating the relationships between species and their surroundings.

Simple dioramas were built in 1928 (lion) and 1930 (polar bear), while the first modern diorama was constructed in 1939. This portrayed the Aboriginals of the Yarra Yarra tribe, and depicted a camp site near Healesville. A great amount of physical and other work went into this first effort: for example, every leaf of the trees and bushes was made by hand, and service groups were brought in to assist the small Museum staff. Subsequently, other methods were devised for preparing natural vegetation for this purpose.

The National Museum then prepared a series of dioramas to present some of the more significant birds and mammals of the region, in lifelike recreations of their natural habitats.

In the fossil gallery an exhibit was prepared on the evolution of the horse, while a special structure in the mineral gallery demonstrated the luminescence of certain minerals under ultra-violet light. In the Upper McAllan Gallery an exhibit was prepared on the cultures of man. Between 1957 and 1962, a number of special exhibits was prepared for the main hall, and for the mineral and fossil galleries.

During the 1960s and 1970s, improvements continued in the exhibits (for example, the Aboriginal display in the North Rotunda). In particular, it proved possible to review the valuable collections which included housing them properly, seeing to their preservation, and initiating more satisfactory cataloguing as well as improving the organisation of the Museum and defining the responsibilities of staff members. Overseas journeys for senior staff to study other museums and to advance their research were introduced. This activity, and the acquisition of some important collections, were greatly assisted by the Scientific Fund.

Continuing research in ecology has shown that the simple concept of the diorama is not the whole story. One change in the environment may have quite extensive and unforeseen results through chain reactions. Thus evolved the concept of the ecosystem which entailed conserving a whole ecosystem in order to preserve an environment. This is the concept now finding expression through the work of the Museum.

The value of the displays as an educational resource for schools was recognised when the Council arranged in 1960 for Education Department teachers to be seconded to the Museum. In 1982, there were six teachers running the Education Office of the Museum, organising the visits of school groups, producing printed materials to supplement the displays, and conducting lessons in the museum and other educational programmes.

One of the most significant events in recent history was the establishment of the "Friends of the Museum Society" in 1979, dedicated to giving assistance to the Museum and serving as a bridge between the Museum and the community. The Society provides a core of volunteers helping curators care for the collections, and guides for the public exhibitions.

In 1980, the Council adopted a new policy document for the Museum's educational and exhibition programmes. Two separate programmes were recognised: redevelopment of permanent displays and the introduction of a temporary exhibitions programme.

Since that time the Museum has presented to the public four or five temporary exhibitions each year on a variety of topics. A flexible display facility was developed in 1980 for a

series of didactic displays on the theme "Extinction is Forever" which deals with topical conservation issues. The first of these dealt with the concept of "rare and endangered species" using the Carnivora as an example. The second, presented in 1981-82, dealt with the plight of marine mammals. The third, in 1983, dealt with ecological problems associated with Victoria's arid and forested lands. These displays were much used by schools as resource material.

The "Friends of the Museum Society" supported a display entitled "The Million Dollar Exhibition", bringing out for public viewing some of the treasures from the collections. Another significant display, presented in 1981, in collaboration with the Victorian Aboriginal community, dealt with the material culture of Aboriginal Society in south-eastern Australia at and since the time of European settlement. Financial support for some of these temporary exhibitions was provided by the private sector.

The "Dinosaurs from China Exhibition" in 1982 was the first effort by the Museum to bring a large exhibition from overseas. Over 200,000 visitors viewed this exhibition and it heralded a new era in the Museum's public programmes.

At the same time, the staff began planning major renovations to the permanent displays. New exhibitions entitled "Australia's First People" and "The Story of Victoria" were designed with the help of outside consultants engaged by the Council. In both cases, the exhibitions attempt to present the material and social culture of Man in environmental context to achieve a blend of human and natural history.

Collections

While important collections are made by staff members during their field work, the greater part of the collections has come from donations from individuals and organisations, and by purchase of important materials.

It was estimated in 1982 that the total number of samples in the collection was well in excess of two million. Most are well documented and the scope and quality of the material make the collections a highly significant portion of the nation's cultural heritage. The introduction in 1982 of computer processing for accessing and retrieving data associated with the specimens assisted in the management of the collection.

Research

A great deal of research is done in the Museum, and this is published in its *Memoirs*, or in recognised scientific journals. In 1940, an important fossil Aboriginal cranium was discovered at Keilor, a Melbourne suburb, and this created wide interest. Later a skeleton was found nearby at Green Gully. In 1947, the President of the Trustees, Sir Russell Grimwade, organised a scientific expedition that crossed the Nullarbor Plain to Western Australia.

Anthropology is an area of active research in the Museum. Studies relate mainly to the social anthropology and material culture of Australian Aboriginals. Financial support has been received in recent years from the Australian Institute of Aboriginal Studies and the Australia Council. In 1982 and subsequent years, the Museum participated in archaeological and anthropological studies in Papua New Guinea in association with La Trobe University.

After the building of the Chowilla Dam on the Murray River had proceeded for two years, the Trustees decided that a salvage research effort should be made on the vast inundation area. Although the building of the dam was later cancelled, a great amount of valuable information and material was collected, and the research report was published as *Memoir 34.*

Later, in 1979, the Council extended this environmental research programme by establishing a Biological Survey Unit which conducts environmental studies, mostly on freshwater habitats and invertebrate faunas. The results of this work are submitted as reports to various Government agencies and also published in the scientific literature. The Council established a new publication series, the *Reports of the National Museum* in 1982, as the vehicle for environmental reports of this kind.

The main thrust of the Museum's research in natural history is in taxonomy. Since 1978, a vigorous research programme has been strongly supported by grants from such bodies

as the Australian Research Grants Committee, the Australian Biological Resources Study, and the Australian Marine Science and Technology Advisory Committee.

Through these research programmes the Museum contributes to the development of knowledge about the human and natural history of the region.

BUREAU OF METEOROLOGY

Before the Second World War

Since its inception in 1908, the headquarters of the Australian Bureau of Meteorology has been located in Melbourne. By the mid-1930s, the number of Bureau staff located in Melbourne was about 40, of an Australian total of probably fewer than 90 persons. Sections housed in the headquarters building "Frosterley" (at the corner of Victoria and Drummond Streets, Carlton) at that time included administration, research, aviation services, climatology, and forecasting. In the head office forecast section — which also served as the Victorian forecast office — a board of meteorologists deliberated daily upon the pressure pattern and its likely changes, and produced in addition to the Victorian metropolitan forecasts, advisory forecasts for the whole of Australia — for aviation as well as for public use. Prior to 1939, observations upon which the forecasts were based were generally taken only at 9 a.m. and 3 p.m.

Regular and accurate atmospheric observation forms the basis of all atmospheric science, as much in the "upper air" as at the earth's surface. To probe the winds at higher levels and obtain a partial three dimensional snapshot of the state of the atmosphere, the flight of a small hydrogen filled balloon was followed daily through use of a theodolite, for a number of years, from a platform on the roof of the Carlton headquarters.

Early in the 1930s, the Royal Australian Air Force (RAAF) also assisted forecasters by recording temperatures at each 300 metre level — to about 5,000 metres — with thermometers strapped to the wing struts of a small aeroplane. By the late 1930s, the "pilot" balloon observations of upper winds had reached 3,000 metres or higher.

Research into weather fronts, during and after the First World War, by a Norwegian meteorologist, Wilhelm Bjerknes, was followed by an awareness of the importance of cold fronts in the 1930s. Observations of large-scale weather systems — in contrast to point observations — also became important, but were hampered by the vast expanses of uninhabited land and of the ocean.

Much of the expansion of the Bureau through the years before the Second World War era was associated with the developing aviation industry. Late in 1936, an expert was brought from England to investigate its requirements and the nucleus of an aviation meteorological service was formed in 1937 as a result. Graduates from the first forecasters' course, attended by senior Bureau officers, became officers-in-charge at the newly established airport weather offices. One of these was situated at Essendon aerodrome. In contrast to the earlier situation, in which all aviation forecasts came from the Carlton headquarters, the new system involved aviation forecast offices which were largely autonomous.

Wartime arrangements

The increasing demand for aviation services eventually led to a reorganisation of the Bureau in 1937 and 1938. An expanded training programme for aviation purposes also assisted the Bureau's preparedness for the subsequent war effort. In July 1939, when war appeared imminent, a conference between the Bureau's executive and senior Armed Forces personnel on meteorological requirements in war recommended that, as the needs of the RAAF were paramount, the meteorological organisation should be transferred to the Department of Air. The transfer took place, first on a civilian basis on 1 July 1940, and later, in April 1941, by a full transfer to the RAAF Directorate of Meteorological Services. Because of increased workloads, staff numbers were raised to about five times those in peacetime employment. In Victoria, meteorological offices were established during the war period at the Laverton and East Sale RAAF bases, and at Mildura.

Early in the war, forecasts for the general public continued to be issued to the press, as well as by telegraph to several country centres for display at post offices. After the RAAF had taken over the meteorological functions, it was decided for security reasons, that an

embargo should be placed upon public weather forecasts. The embargo continued until late 1944, though some "severe weather" warnings were still issued to the public. Information for the military forces was also passed twice daily to the "war room", and coded advisory forecasts and situation statements were broadcast to military bases.

The supply of meteorological information to the Armed Forces was concerned largely with tropical areas. Supporting research was therefore geared to meet this need, and a series of Research and Development Bulletins, published from Melbourne, attracted much interest. The Bureau's climatological expertise also provided farmers with advice on weather aspects of food production.

Wartime developments in many other fields have also proved valuable over a long period. One of these is radar, used by meteorological services for "wind finding" and to locate and study characteristics of rain areas. Another is the "radiosonde", consisting of a small radio transmitter coupled to pressure, temperature, and humidity sensors, and flown attached to a balloon. This device was introduced into Australia in 1943 when regular upper air observations commenced from Laverton and forward campaign areas.

Post-war developments

After the war, major structural changes became necessary in the Bureau. For example, although the number of wartime staff exceeded those of peacetime, immediate post-war demands for service were still difficult to meet. This was a result partly of many wartime meteorological officers returning to their previous occupations, and of a heightened demand for meteorological services, particularly from the aviation industry. Whereas pre-war flying was confined to daylight hours, aviators after the war required an around the clock service. Demand for a climatological service also came as a result of the post-war rural resettlement schemes. The Bureau's six State directors became chairmen of Climatological Consultative Committees, whose members included representatives of weather and climate sensitive industries. Particular projects included involvement in the Murray River development plan, and the setting of climatological safety limits for marginal wheat growing areas.

The Victorian office was still essentially part of the head office structure at this time, forecasting being the only separate "regional" function. Other facets, such as administration, climatology, and the installation and maintenance of field equipment were supervised by head office personnel. The aviation offices were also under head office control, although close liaison existed between them and the forecasting section.

If one of the bases of meteorology, and of forecasting in particular, is a good observing system, then equally fast and reliable communications for observations, forecasts, and warnings are also necessary. During the 1950s, communication methods became an important consideration for the Bureau. Television transmissions commenced in Melbourne in 1956; the commercial networks and the Australian Broadcasting Commission both telecast weather information either direct from the forecast office, or, using Bureau forecasters, from their own studios. In 1957, another new dissemination method for weather information was introduced: the automatic telephone forecasting service. In its first week of operation, an average of 20,000 calls per day were received, and an extra ten telephone lines had to be added to the original thirty to cope with the traffic. Likewise just as weather flags were flown above the Bureau and two newspaper offices in the 1930s, weather "beacons" were erected in 1958 — one on the MLC insurance building in the city, the other on the CUB building in Carlton.

In 1955, the original Meteorology Act of 1906 was superseded. The new legislation formalised Bureau responsibility for the supply of information and advice, and for the advancement of meteorological science. In addition, it reaffirmed the Bureau's traditional role in the collection and processing of data and the issue of forecasts and warnings. In the reorganisation of functions and staffing which followed, the Victorian office was granted a greater degree of autonomy, although its physical location was still within the head office building. Victorian aviation offices were also transferred to regional office control.

To improve the standard of service, a "fire weather" organisation was established at head and regional office levels in 1956, and a hydrometeorological service was organised in head office. Among other demands, this new service catered for forecasts of flooding

for the developing Snowy Mountains Scheme. A regional office flood forecast group commenced in 1967 and a special "fire weather" meteorologist position was created in the region in 1964.

Together with greater specialisation in consultative services, data processing methods and observing systems advanced rapidly during the decade to 1970. Wider use came to be made of weather radar in Victoria, with an installation at Mildura in 1963 and the replacement of Laverton's old 1949 radar by newer models in 1962 and 1966. The regional office at last moved away from "Frosterley" to Tilley's building in La Trobe Street, Melbourne, in late 1961, and in 1964, radar, controlled from the regional office, was installed at the University of Melbourne for the purpose of weather watching.

New technologies

Perhaps the most significant single advance in weather observing came with the launching of the first weather satellite, by the United States of America, in 1960. For the first time, weather analysts and forecasters were able to see an instantaneous weather picture covering many thousands of square kilometres. In the early stages, pictures would be taken only in daylight hours but later developments, using infra-red sensors, allowed for both day or night photography. In 1977, the launching of the Japanese geosynchronous satellite advanced meteorological observing further by providing time lapse style photography over the one area.

In line with the world wide developments in automatic computation and data processing, an automatic data processing group was established in the Bureau's Melbourne head office in 1962. Computer specifications were issued in 1965, and the first high speed facility was installed in 1968, with an identical back-up unit the following year. For the regional forecaster, the introduction of the computer meant that use could be made of many different mathematical "models" (mathematical approximations to the real atmosphere), each giving forecasts of weather patterns almost entirely free from manual intervention. Early methods often involved subjective rules, but improvement in modelling, both overseas and in Australia, has contributed towards a slow but gradual improvement in forecast accuracy.

The growth in public awareness of advancing technology paralleled a significant shift in public attitudes towards the environmental balance, and in particular to the problem of air pollution. The Bureau at regional level studied the atmospheric air pollution potential and results of its findings were presented at a conference on clean air in 1972. Requests for information and advice on the application of meteorology to various industrial and agricultural problems are investigated by the "Special Services" section, which was formed in the region before the second move of the office, this time to the Commonwealth Centre, at the corner of Spring and La Trobe Streets, Melbourne, in 1966.

The search for oil and gas in Australia also led to a specialised forecast service within the Victorian region. In 1969, the Esso and BHP companies hired specialist American forecasters to supply a wave forecast service for the oil and gas platforms in Bass Strait. The forecast unit was located at East Sale and worked with regional office meteorologists who subsequently assumed the forecast role. This unit was transferred to the Victorian office in 1973. Prior to such a formalised service, regional office forecasters, from about 1965, provided regular weather advice for drilling operations, based largely upon studies of winds and waves carried out by Bureau staff.

In 1968, a new meteorological office opened at Moorabbin airport to service the needs of light aircraft operators, and in 1971 Tullamarine became the main Victorian aviation forecast centre. In 1973, the expanding and more specialised operations of the Bureau in Victoria were brought together in one location — the Regional Forecast Centre, situated in the Commonwealth Government Centre, Melbourne. This forecast office then included staff preparing forecasts for the public, for shipping and aviation, for oil and gas platforms, as well as other special forecasts for flooding, fire, and the like. The airport offices became largely briefing locations for aircrew with this change, with some RAAF meteorological training at East Sale. During 1982, a new era commenced when a computer system called AROS (Automated Regional Operations System) was installed. This system allows for the composition and editing of forecasts and warnings and access to a sophisticated forecast guidance system through a number of interactive VDU terminals. The computer checks

and plots all incoming observations for the forecaster as well. AROS has been designed to improve the forecaster's decision making capabilities. In addition to the forecast area, the regional office contained a "Facilities" section, responsible for the installation and maintenance of equipment; an Administration section; and the Special Services section.

ANTARCTICA

The foundations for Australia's claim to Antarctic territory were laid by the two expeditions led by Sir Douglas Mawson — The Australasian Antarctic Expedition (1911-1913) and the British-Australian-New Zealand Antarctic Expedition (1929-1931). The formal steps taken to establish the claim were an Order-in-Council of the British Government of February 1933 and the Australian Antarctic Territory Acceptance Act of 1933 (proclaimed August 1936).

Australia's Antarctic activities were permanently established when, in 1947, the Australian National Antarctic Research Expeditions (ANARE) were established with headquarters in Melbourne under the Commonwealth Department of External Affairs. An Antarctic Division of the Department was set up late in 1948.

Group Captain Stuart Campbell, RAAF, was seconded from the Department of Civil Aviation in 1947 to become Officer in Charge of the ANARE. In the first year, two sub-Antarctic research stations were established (Heard Island in December 1947 and Macquarie Island in March 1948) using HMAS *LST 3501*, while HMAS *Wyatt Earp* made a voyage of reconnaissance to the coast of Antarctica early in 1948. At the end of the year Stuart Campbell returned to his position with the Department of Civil Aviation and Phillip Law succeeded him as leader of the ANARE. Australia's Antarctic endeavours were to be directed from Melbourne until 1981 when the headquarters moved to Hobart.

Between 1949 and 1953, the efforts of the ANARE were aimed at: (1) the development of scientific programmes at the two island stations; and (2) preparations for ultimately establishing a station in Antarctica. The ANARE Planning Committee, comprising representatives from interested departments, authorities and academic bodies, as well as the Armed Services, set up sub-committees to work out continuing programmes of research and investigation in various scientific disciplines.

The Antarctic Division Headquarters in Melbourne were developed to provide logistic, scientific, and personnel support for the expeditions and a wide and unsuccessful search was made for an ice-going ship suitable for an Antarctic venture. Experience was also gained on the Norwegian-British-Swedish Expedition to Dronning Maud Land and on the French Antarctic Expedition to Adelie Land.

During 1950 to 1952, the Antarctic Division collaborated with the Australian Shipbuilding Board on the design of a new Antarctic ship and sought Commonwealth Government approval to have it built in Australia. However, in 1953, these plans were abandoned when it was learned that a Danish firm, J. Lauritzen Lines, had just built an ice-strengthened ship for the north Greenland trade. The Planning Committee agreed to, and the Commonwealth Government approved of, the charter of this vessel for an expedition to establish an ANARE station on the Antarctic continent in 1954.

In the Lauritzen ship *Kista Dan*, Law led an expedition that established Mawson Station in MacRobertson Land in February 1954. A wintering party of ten men was left behind. In succeeding years the station was considerably extended and its complement increased to some 26 men.

When scientists throughout the world proposed the International Geophysical Year (IGY) of 1957-58, emphasis was placed upon two major programmes — exploration and research in Antarctica, and space research. The stimulus of world wide competition, and the political pressure exerted upon Australia's Antarctic claims by the establishment of Antarctic bases by other nations, resulted in a major expansion of ANARE activities. The Heard Island station was closed in 1955 and a new station, Davis, was built in 1957 for the IGY. At the end of the IGY, in 1959, Australia took over the United States of America station, Wilkes. Later, in 1969, this station was abandoned and Australian activities in the region were transferred to a new base, Casey, built nearby.

Apart from the four years from 1965 to 1968, when Davis station was temporarily closed, Australia has continued to maintain the stations at Macquarie Island, Mawson, Davis, and Casey.

The chartered Danish ships, *Nella Dan* and *Thala Dan*, and the Danish ship *Nanook S* provide the logistic support, but this was later augmented by the air transport of personnel, via New Zealand and the United States of America McMurdo station, to Casey. This air link ceased late in 1981.

Australia's Antarctic programmes span a wide range of disciplines. Exploration and mapping played a major role in the first twenty years, when some 4,000 kilometres of coast and some 800,000 square kilometres of territory were mapped. Fixed wing aircraft and helicopters greatly assisted the work. Most of it was carried out during summer ship voyages but for several years ANARE aircraft were flown and maintained at Mawson by RAAF personnel seconded to the expedition.

Field work in glaciology, geology, zoology, botany, gravity, and marine sciences, demanded complex and extensive logistic support and planning. Observatory work at the stations embraced meteorology, geomagnetism, seismology, upper atmosphere physics, and cosmic rays. Investigations were also carried out in human biology, medicine, and psychology.

In 1968, the Antarctic Division was transferred from the Department of External Affairs to the Department of Supply, where it remained until 1972. In that year it was placed under the Department of Science, which after some changes in nomenclature, became known as the Department of Science and Technology.

International co-operation in Antarctica stands high. The Antarctic Treaty nations meet at Treaty Consultative Meetings every two years. Their work has resulted in a conservation regime in Antarctica unmatched by that of any other continent. Nations active in Antarctica send delegates to the Scientific Committee on Antarctic Research (SCAR) which also meets every two years. In Australia, the Australian Academy of Science established in 1958 a committee (the Australian National Committee on Antarctic Research) to act as the national contact with SCAR and advise the Commonwealth Government on possible future scientific programmes.

In 1979, the Department established a committee with the title of the Antarctic Research Policy Advisory Committee to review Australian research policies in the Antarctic and the surrounding oceans, to recommend priority areas for research into the potential resources of Antarctica, and to advise on the role to be played by the Antarctic Division.