SABBATICAL LEAVE REPORT
OF
TRAVEL SABBATICAL
TO
NEW ZEALAND AND AUSTRALIA

LOUIS W. SHAINBERG

Submitted to
The Board of Trustees
of
Mt. San Antonio College
October, 1985

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MT. SAN ANTONIO COLLEGE
Salary and Leaves Committee

APPLICATION FOR SABBATICAL LEAVE

Name of Applicant Louis W. Shainberg

Address 459 Greensboro Ct. Claremont, CA 91711

Employed at Mt. San Antonio College beginning Sept. 1962

Dates of last sabbatical leave:

From none taken To

Department Biological Sciences Division Natural Sciences

Length of sabbatical leave requested:

One semester xx
Fall ____ Spring xx

Two semesters ____

Administrative ____

Purpose of sabbatical leave:

Study ____ Independent Study and Research ____

Travel xx Combination (specify) ____

NOTE: Sabbatical periods are limited to contractual dates of the academic year.

Effective dates for proposed sabbatical leave:

From Feb. 1985 To June 1985

and (if taken over a two school year period)

From To

Attach a comprehensive, written statement of the proposed sabbatical activity(ies) including a description of the nature of the activity(ies), a timeline of the activity(ies), an itinerary, if applicable, the proposed research design and method(s) of investigation, if applicable.

Attach a statement of the anticipated value and benefit of the proposed sabbatical activity(ies) to the applicant, his/her department or service area, and the College.

Any change or modification of the proposed sabbatical activity(ies) as evaluated and approved by the Salary and Leaves Committee must be submitted to the Committee for reconsideration.

Louis Shainberg
Signature of Applicant

14 November 83
Date

Applicant's Name Louis W. Shainberg

The acknowledgment signatures reflect awareness of the sabbatical plan for the purpose of personnel replacement. Comments requested allow for recommendations pertaining to the value of the sabbatical leave plan to the College. Applicants must obtain the signatures of acknowledgment prior to submitting application to the Salary and Leaves Committee.

ACKNOWLEDGMENT BY THE DEPARTMENT/DIVISION

Signature of Department Chairperson William R. Hawkins Date 11-16-83

Comments: Proposal shows great potential to enhance Dr. Shainberg's teaching.

Signature of Division Chairperson Barbara Crane Date 11/28/83

Comments: An ambitious travel plan for the time available

ACKNOWLEDGEMENT BY THE OFFICE OF INSTRUCTION

Signature of Asst. Superintendent/Vice President, Instructional & Student Services Joseph M. Majorek Date 11-28-83

Comments:

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FINAL ACTION BY THE SALARY AND LEAVES COMMITTEE:

_____ Recommend approval to the Board of Trustees

_____ Not recommend approval to the Board of Trustees

_____ _____
Signature - Chairperson, Salary and Leaves Committee Date

_____ _____
Signature - Authorized Agent for the Board Date

myw
10/13/83

Sabbatical Leave Proposal
Lou Shainberg

PROPOSED SABBATICAL ACTIVITIES

I propose spending three months traveling through New Zealand and Australia, approximately mid-February through mid-May, 1985.

As this is the Fall of the year in the Southern Hemisphere I propose beginning on the South Island of New Zealand while the weather is still good, progressing to the North Island of New Zealand, then to Southern Australia, Central Australia, and finally to Northern Australia.

I propose visiting National Parks, Wildlife Preserves, and Natural History Museums, with the goal of gathering information to enhance the courses I teach. I expect to do extensive photography in all areas visited as I use 35 mm slides in most of my lectures.

In addition, I propose visits to Colleges and Universities with the goal of acquiring new ideas to incorporate into the courses I teach at Mt. San Antonio College.

ANTICIPATED VALUE OF THIS SABBATICAL

Australia and New Zealand are renowned for their unusual and significant flora and fauna as well as important wildlife habitats such as deserts, mountains, reefs.

I believe that a visit to these countries would provide me with knowledge, insights, and photographs that would enrich the courses I teach in the Biological Sciences Department.

Upon my return, I propose holding a series of informal seminar sessions with my colleagues in the Biological Sciences Department and making copies of photographic slides available for their classroom use.

I believe that my value to Mt. San Antonio College would be enhanced by my travel through New Zealand and Australia.

NEW ZEALAND
Specific places to visit:

South Island
- Christchurch
  - University of Canterbury (new, modern campus)
  - Hagley Botanic Gardens (labeled trees of the world)
  - Canterbury Museum (Antarctic biology and geology)
  - Deans Bush Swamp Forest Reserve (native swamp forest)
- Canterbury Plains (rich agricultural area)
- The Otago Coast (coastal bird sanctuary)
- Mount Cook
  - Mount Cook National Park (glaciers; native wildlife)
  - Tasman Glacier
- Dunedin
  - University of Otago (oldest in New Zealand)
  - Otago Museum (marine life; Polynesian, Maori cultures)
  - Botanic Gardens (rhododendrons)
- Marlborough Sounds Maritime Park (breeding grounds for many bird species)
- Westland National Park (glaciers, wildlife exhibits)
- Lake Wakatipu (unusual seich action)
- Fiordland National Park (wilderness, rare birds)

North Island
- Auckland
  - Auckland University
  - Auckland Zoological Park (kiwi display)
  - War Memorial Museum (comprehensive natural history displays)
  - Bay of Islands (coral beds)
- Kauri Forest Reserves (giant trees over 1000 years old)
- Waitomo Caves (lit by thousands of glowworms)
- Rotorua
  - Maori Cultural Theatre
  - Whakarewarewa Thermal Reserve (geothermal activity; kiwi; Maori cultural displays)
  - Ohinemutu Maori Village (long term use of geothermal energy)
  - Waipahihi Botanical Reserve (native plants)
- Wanagnui Regional Museum (natural history; Maori Culture)
- Wellington (capital of New Zealand)
  - Victoria University of Wellington
  - Botanical Gardens (tropical plants)
  - National Museum (natural history and cultural displays)

AUSTRALIA
Specific places to visit:

Tasmania
- Hobart (capital city)
- Hartz Mountains National Park (Tasmanian devils)
- Mount Field National Park (rain forests)
- Cradle Mountain-Lake St. Clair National Park (312,000 acre wildlife sanctuary)

South Australia
- Adelaide
  - Botanic Garden (native vegetation)
  - South Australian Museum (natural history; Aboriginal displays)
- Farming areas (Australian farming methods)
- Cleland Conservation Park (native animals in natural habitats)

Victoria
- Melbourne
  - National Gallery of Victoria (Australian and worldwide art)
  - National Museum (Aboriginal displays)
  - Institute of Applied Science (technology)
  - Zoological Garden (Australian animals in natural habitats)
  - Royal Botanic Gardens (exotic plants)
  - Ferntree Gully National Park (unusual plants and animals)
  - Sherbrooke Forest (lyrebirds)
  - William Ricketts Sanctuary (giant tree ferns)
  - Sir Colin MacKenzie Wildlife Sanctuary (platypus, wombats, kangaroos, koalas)
  - Kinglake National Park (many bird species)
  - Wilson's Promontory National Park (abundant wildlife)
  - University of Melbourne (first in Australia to admit women)

Canberra, Australian Capial Territory (A.C.T.)
- Institute of Anatomy (human body; Aboriginal displays)
- Tidbinbilla Nature Reserve (kangaroos, koalas, emus)
- Tour to a sheep station

New South Wales
- Sydney
  - Royal Botanic Gardens (over 400 varieties of plants from around the world)
  - Australian Museum (natural history; extensive aborigine section)
  - Taronga Park Zoo (over 3000 mammals, birds, reptiles)
  - Opera House (one of world's 10 most architecturally significant buildings)
  - Art Gallery of New South Wales (Australian artwork)
  - Museum of Applied Arts and Sciences (technology)
- Ku-ring-gai Chase National Park (rich in native plants and animals; swamp wallabies, koalas)

Queensland
  Brisbane
    Queensland Museum (displays on Aborigines and Great Barrier Reef)
    Botanic Gardens (subtropical plants)
    Lone Pine Koala Sanctuary (largest koala colony on public display)
    Mount Coot-tha Forest Park (2000 kinds of plants)
  Cairns (tropical town; boats to Great Barrier Reef)
  Great Barrier Reef (one of world's most notable biological phenomena; coral and other marine organisms; 1,250 miles long and 10-150 miles wide)

Northern Territory
  Darwin (tropical vegetation and wildlife)
  Botanical Garden (tropical flora)
  Magnetic anthills (termite nests)
  Fogg Dam Bird Sanctuary (thousands of birds; wild buffalo)
  Alice Springs (isolated town in outback)
  Ayers rock (world's largest monolith; 5½ mile perimeter)

When visiting Colleges and Universities, specific goals include:

--interview people teaching the same subjects I teach (General Biology, Microbiology, Health Science, and Human Sexuality) with emphasis on learning new and innovative teaching methods;

--visit Biology and Microbiology teaching laboratories to get ideas for renovation and modernization of old teaching laboratories at Mt. San Antonio College

--look for ideas for new laboratory exercises that can be accomplished using existing (limited) lab equipment available at Mt. SAC

Note: specific activities during sabbatical may vary slightly from above list due to uncontrollable factors such as weather, strikes, etc.

Addendum to Sabbatical Application
Louis Shainberg

1. Content of proposed seminars:

   These seminars would present material of evolutionary and environmental significance, as related to courses being taught within the Biological Sciences Department of Mt. San Antonio College.

2. How many seminar outlines would be developed?

   Four. One each covering South Island New Zealand, North Island New Zealand, Southern Australia, and Northern Australia including the Great Barrier Reef.

3. Extensiveness of slide program:

   As I am an avid photographer and would be traveling with extensive equipment, I would anticipate returning with approximately 1,000 slides.

4. Interview and research methods:

   My perception of Australian people is that they would respond most favorable to an informal interview approach. I would call the appropriate department or division of each college, arrange an appointment with one or more professors in my subject areas, introduce myself, ask to tour teaching laboratories, and casually ask questions regarding course content and teaching methods.

STATEMENT OF PURPOSE

New Zealand and Australia hold great interest for any biologist. They represent extremely old land masses that have long been geographically isolated from other land masses, allowing the evolution of many unique organisms. Each of these countries includes an unusually wide variety of life zones and habitats, many of which are unique in the world. Also, each country contains remnants of its pre-European culture and offers the opportunity to observe the ongoing interaction between that culture and the European culture that has largely displaced it.

I had long been aware that a visit to New Zealand and Australia would enrich my teaching in the Biological Sciences Department and enhance my value to Mt. San Antonio College and my students. I first considered visiting these countries during one or more of our summers. However, that would have been midwinter in the Southern Hemisphere and many of the activities that were part of this sabbatical would have been precluded by weather conditions. Thus, it was decided that a one-semester sabbatical would offer the best means of studying New Zealand and Australia.

More specifically, the following goals for the sabbatical were established:

1. Visit, study, and photograph areas of special biological interest in New Zealand and Australia.

2. Integrate information on these places, where appropriate, into the courses I teach at Mt. San Antonio College.

3. Use 35 mm transparencies (slides) taken, where appropriate, in the courses I teach.

4. Make slides available to other instructors at Mt. San Antonio College for use in their classes.

5. As certain of the courses I teach, such as Human Sexuality and Health Science, contain cultural elements, become familiar with the Maori, Aboriginal, and European cultures of New Zealand and Australia. Where appropriate, use examples from these cultures to illustrate concepts covered in my courses.

6. Visit major universities in New Zealand and Australia, acquiring new ideas to incorporate into the courses I teach at Mt. San Antonio College.

7. Upon return, during the school year 1985-86, hold a series of slide-seminars for my colleagues, sharing some of what I have learned and apprising them of slides that are available for incorporation in their courses.

GENERAL PLAN

It was decided to allot 6 weeks to New Zealand and 10 weeks to Australia. Arrival would be in the summer (February 12) and departure would be in early winter (June 1). As the bulk of New Zealand is more southerly than Australia, New Zealand would be visited first while the weather was still most favorable for travel. The general plan of travel for Australia would be from south to north, allowing near-ideal weather throughout the trip. Southern Australia would be visited in the fall and northern Australia in early winter. The northern portion of Australia is quite tropical and warm throughout the year. However, most of the rain falls during the summer, so winter is the ideal time for a visit to this region.

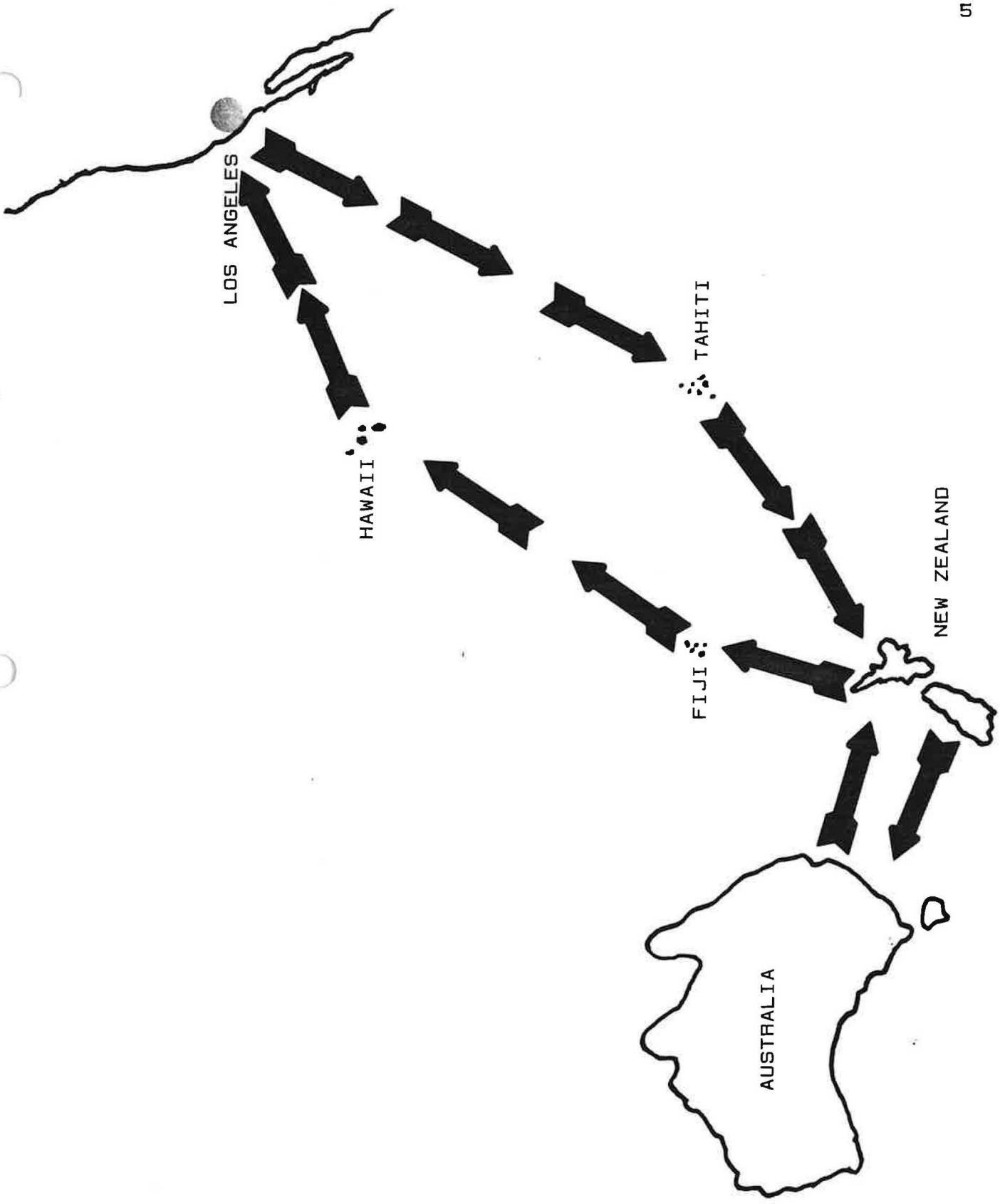
Major distances would be covered by air, with one leg by train. Most local travel would be by rented car. Since "outback" Australia presents special travel challenges, a group tour was booked for part of the time in that area.

No permanent base of operations would be established as so many widely scattered locations were to be visited. The length of stay in any one location would seldom exceed four days.

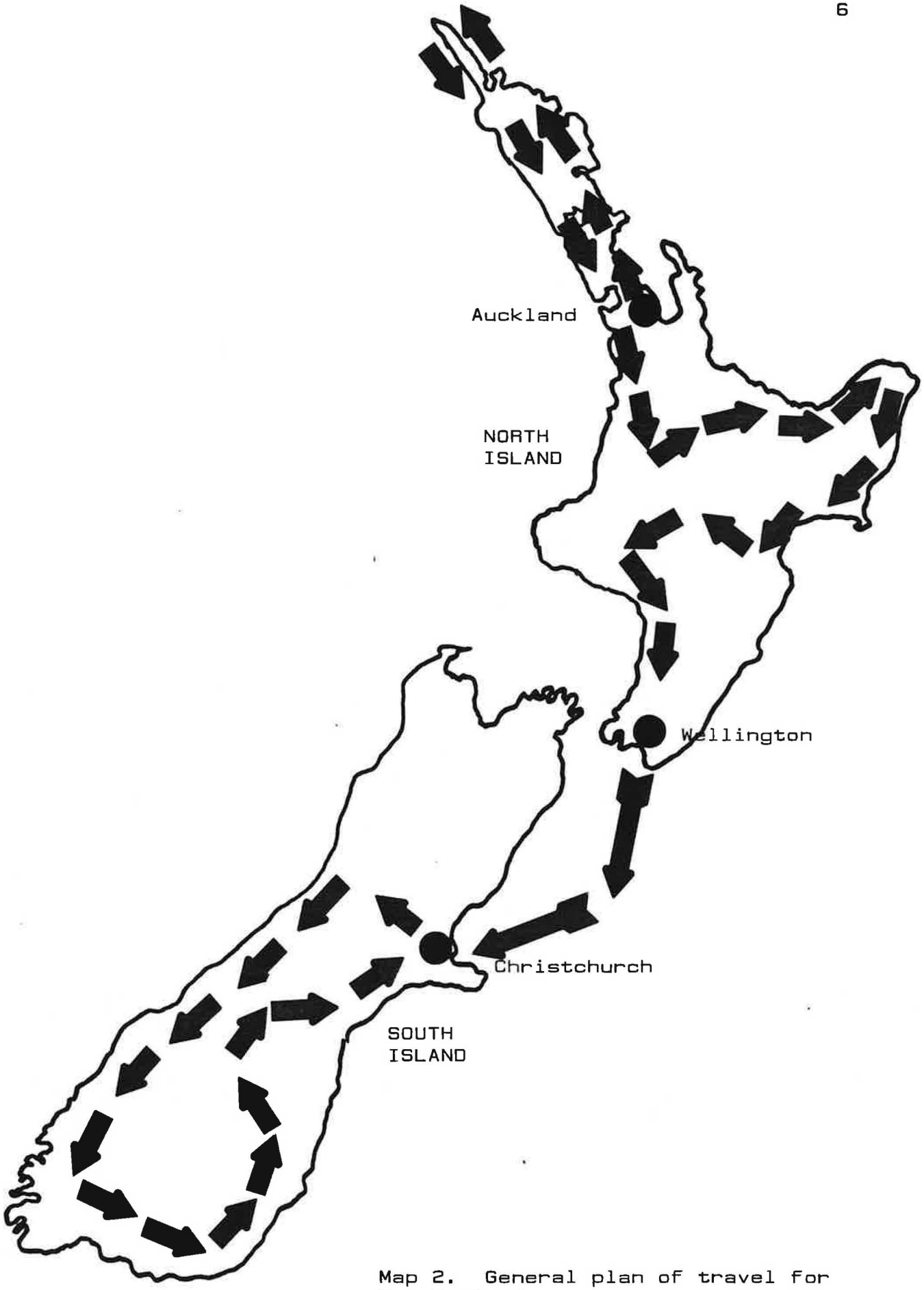
Upon arrival in Australia I consulted biologists at the Sydney University concerning my Australian itinerary. They suggested several minor changes which would allow me to see more of biological interest in the time available. Tasmania and Darwin were bypassed, allowing me to add a visit to

Western Australia, which was not originally planned, and to spend more time on the biologically significant Great Barrier Reef than had originally been allotted.

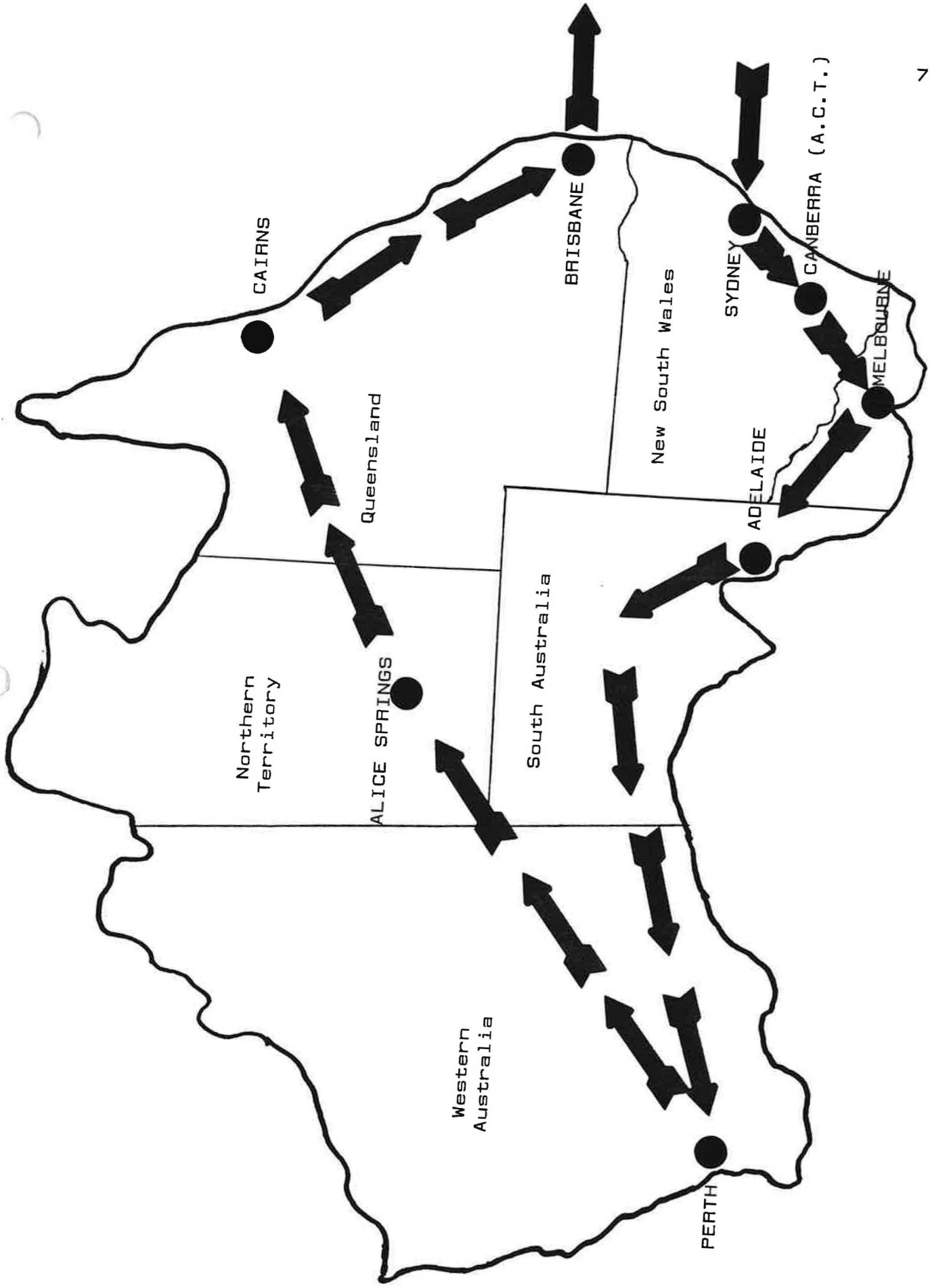
The following three maps illustrate the overall plan of travel and the general routing through New Zealand and Australia.



Map 1. Air routes to and from New Zealand and Australia.



Map 2. General plan of travel for New Zealand.



Map 3. General routing for Australia.

SPECIFIC SABBATICAL ACTIVITIES

12 February 1985. After crossing the equator and international date line, I arrived at Auckland, North Island, New Zealand and spent the remainder of the day getting organized and oriented.

13 February. For an introduction to New Zealand, I visited the War Memorial Museum. There were excellent displays on Maori history and culture and on the natural history of New Zealand, including most biolgical and geophysical aspects. In the afternoon, I took a bus tour of Auckland which gave many insights into the geography, culture, and economy of New Zealand.

14 February. Spent the morning at the Museum of Transportation and Technology (MOTAT). Displays traced the history of every form of transportation, including aerospace. Many implements of agriculture were on display.

In the afternoon I toured the Auckland Zoo, a fine zoological garden. Special features included a good bird collection and kiwis on view in a specially constructed nocturnal room with very dim lighting simulating moonlight.

I also toured the campus of Auckland University, which was closed for summer holidays at the time.

15 February. Drove north to Paihia and the Bay of Islands.

16 February. Visited the Waitangi State Forest Reserve. This area was formerly kauri forest, but was all cut. Foresters are now experimenting with various species of pine trees

for reforestation projects throughout New Zealand. Visited the Waitangi Treaty house where Maori chiefs signed a treaty giving sovereignty to Queen Victoria. Toured the Kerikeri area, the center of the New Zealand citrus and kiwifruit industries.

17 February. All day boat tour in the Bay of Islands. The boat on this trip delivers mail and groceries to people living on various islands and remote mainland locations. Saw many marine birds and viewed reforestation projects on some of the 49 islands in the bay. In the evening, drove further north to Kaitia.

18 February. Drove to the extreme northern tip of New Zealand (Cape Reigna). Passed through Maori cooperative tribal farmland. The small amount of remaining native bush was being cleared for sheep grazing. Monterey pines (Pinus radiata) were being planted in many areas to control erosion where native vegetation had been unwisely removed. This is a problem throughout New Zealand. Brush has been removed for sheep grazing, but the land has been too steep to be held by grasses and severe erosion has occurred, along with severe flooding in low-lying urban areas. Visited the Sweetwater Forest Nursery north of Kaitia where millions of pine seedlings are grown each year for planting in eroding areas.

19 February. Heading south, passed through the Waipoua Forest Kauri Reserve, among the few places where kauri trees remain. Kauri forests were once common over much of New Zealand, but were logged for their desirable timber. These

trees grow very large, but very slowly (many are over 1000 years old). The wood decays very slowly (samples over 30,000 years old have been dug from swamps). Kauri gum, which is fossilized sap, is found buried near old dead trees and was dug for many years for use in linoleum and other products.

20 February. Visited the Waitomo Glow Worm Caves. Glow worms, found in many places in New Zealand are not the same as the American glow worms, which are beetles. New Zealand glow worms are actually the larvae of fungus gnats (Diptera: Mycetophilidae: Arachocampa luminosa). They hang from the roofs of caves and glow to attract insects. Each larva has an average of 30 hanging web "fishing lines" covered with dots of acid to snare and paralyze flying insects.

21 February. Drove to Rotorua via the back road, through cultivated pine forests. Arriving at Rotorua, I observed geothermal activity virtually everywhere. I drove to the Agrodome, about 8 kilometers north of Rotorua, an educational display on the sheep industry. The Agrodome displays many common and unusual breeds of sheep, explaining the characteristics of each (Figure 1). Sheep shearing and sheep-dog behavior are demonstrated. The grounds contains a small arboretum of native New Zealand plants. In the evening, I visited a wildlife refure on Lake Rotorua, viewing many species of waterfowl.

22 February. In Rotorua, I visited the Maori Arts and Crafts Institute. Here young people are trained in traditional Maori crafts such as wood carving (Figure 2) and weaving. On

the grounds is a reconstructed Maori pa (village). I visited the nearby Whakarewarewa Thermal Area, a zone of intense geothermal activity containing many vents, pots, geysers, and boiling springs. I attended a show of traditional Maori songs and dances at the Maori Arts and Crafts Institute. In the evening, I attended a traditional Maori hangi featuring Maori foods and performing arts.

23 February. Drove 25 kilometers south to visit the Waimangu Thermal Valley. this was the site of the 1886 eruption of Mt. Tarawera which buried the entire town of Te Wairoa and formed Lake Rotomahana in the largest crater. This is still an area of intense geothermal activity with boiling springs and fumeroles everywhere. Despite the forbidding nature of this area, there were many waterfowl in Lake Rotomahana.

Visited the Waipahiti Botanical Reserve. Took a bushwalk through an excellent collection of native New Zealand plants.

Toured Ohinemutu Maori village, which is similar to any suburban neighborhood, except for its intensive use of geothermal energy to heat homes and water and for cooking.

24 February. Began touring the East Cape of the North Island, important historically and now primarily populated by Maori people. This was the first part of New Zealand to be seen by Captain Cook. There has always been much resistance to European settlement and most of the land is still Maori owned and populated. The people live in many small villages, each with its central marae area and carved meeting

house in daily use. Maori carving has tremendous social, religious, and esthetic significance and, consequently, many rituals and prohibitions. For example, women are not allowed to be present (all carvers are male) and all shavings are ceremoniously burned.

Land in this area shows severe erosion as a result of clearing of steep slopes by early farmers.

25 February. Drove down the East Cape from Hicks Bay to Gisborne. Passed through large sheep stations, mostly Maori owned and operated (Figure 3). Maori tribes have leased some sheep land to European-derived people.

Met and interviewed the Waiapu County noxious weed control officer. He contrasted Maori and European farming practices and took me to see examples of severe erosion problems where native vegetation has been cleared for sheep. He also showed me successful pine reforestation projects and told about pine culture. Intensive culture practices yield mature trees in 20 years.

26 February. Drove from Gisborne to Napier. Saw large sheep stations and much severe soil erosion. Also saw thousands of acres of recent pine plantings.

At Napier, I visited the Napier Oceanarium and Aquarium, considered the best in the Southern Hemisphere. Saw a good assortment of living marine and freshwater fishes and other marine organisms. Also viewed a collection of land reptiles and amphibians as well as displays on wave action and tidepool ecology.

27 February. Drove from Napier to Taupo, passing through

extensive reforestation areas of Pinus radiata. Most of the trees were in excellent condition, carefully tended. Forests are periodically thinned with small trees removed and used for fence posts. Pine trees are sprayed annually with 2,4,5-T during a one-month dormancy and given an annual aerial application of fertilizer.

Toured the Wairakei Geothermal Power Station, source of 5 percent of New Zealand's electricity. There are 57 bores averaging 600 meters deep. Each bore has 2 or 3 flash points where pressure is reduced by steps, allowing the release of steam from the superheated water. Final pressure release is in large "silencers" (actually very loud). Pipes from all wells extend to two steam turbine powerhouses.

28 February. Visited Tongariro National Park. Saw a vast acreage of young Pinus radiata and some cultivated gum forest. Toured a preserved and restored Maori village from pre-European times. Tongariro is the world's second National Park (after Yellowstone) and the first in New Zealand, dating from 1887. It has an area of over 70,000 hectares and contains 3 active volcanoes. There are lava flows of various ages, glaciers, and excellent hiking.

1 March. Drove to Wanganui, one of New Zealand's oldest cities. Located on the longest navigable river in New Zealand, Wanganui contains many historic buildings plus many very contemporary structures. Visited the Wanganui Regional Museum, largest regional museum in New Zealand. Viewed a fine collection of Maori arts and crafts and a large natural

history collection featuring birds, insects, native trees, introduced mammals, and New Zealand geology.

2 March. In Wanganui, toured the Robertson Private Museum Collection at Waireka Estate. This outstanding private collection includes insects, birds, mammals, minerals, and Maori artifacts. It is rated as one of the finest private museums in New Zealand.

Drove on to Wellington, passing through sheep stations and fruit orchards.

3 March. Toured and photographed the Wellington Botanical Gardens, consisting of 32 hectares of native and exotic plants, all named and well tended.

Toured the National Museum, which is similar in content to the War Memorial Museum in Auckland, but not as comprehensive or as well displayed.

4 March. Visited Victoria University in Wellington. With 7,000 students, it is the second largest in the nation. Like all New Zealand Universities, Victoria is funded by the National government and awards the B.S. in 3 years. Those going on to graduate school take a fourth honors year. Pre-medicine is only one year and a physician has only a B.S. (is not a doctor).

Learned that a college in New Zealand is the equivalent of our high school. It can be public or private and instead of grades 9-12 is divided into forms 1-7. Form 7 is only for university bound students. There is no college diploma or graduation, but passing the School Certification exam is the equivalent of having a diploma.

The University Entrance (U.E.) exam determines how much the government will pay for tuition and books. Top students pay very little for their education. All students living away from home receive a housing allowance.

In New Zealand, Microbiology is usually not offered as such. The material included in this field in the United States is usually divided between Botany, Zoology, and Biochemistry Departments. I interviewed a professor from each of these areas. Actually the title of Professor is used only by a Department Chairperson. The academic ranks are:

--Professor (the Department Chairperson)

--Associate Professor (usually called Reader; the assistant chairperson)

--Senior Lecturer

--Lecturer

--Junior Lecturer

Professors interviewed were:

1. Dr. T. W. Jordan, Department of Biochemistry. Dr. Jordan is doing research on the effects of the fungal toxins sporidesmin and gliotoxin on human and animal cell membranes, with special emphasis on sheep.

2. Dr. J. E. Sheridan, Botany Department. Dr. Sheridan is working on fungicide resistance in plant pathogenic fungi damaging grain crops in New Zealand. He has found that the resistant strains of fungus were introduced via contaminated and incompletely treated seed imported from Scotland.

3. Dr. C. H. Daugherty, Department of Zoology. Dr. Daugherty

does research on electrophoresis of proteins to determine evolutionary relationships and speciation in New Zealand lizards and Kiwis. He is convinced that there are more than the 3 species of kiwis that are currently accepted.

I learned that teaching loads are very light in New Zealand universities. For example, Dr. Daugherty teaches only 35 one-hour lectures and 15 three-hour labs per year. Dr. Sheridan confirmed a similar teaching load. Emphasis in research is on practical problems and good funding is available for practical research, especially on agricultural topics.

5 March. Flew from Wellington to the South Island, landing at Christchurch. Drove rented car west to Hokitika. En route passed through Arthur's Pass National Park, New Zealand's fourth largest at 100,000 hectares (247,000 acres). This is a spectacular area of podocarp forest, alpine flora, beech forest, and the northernmost glaciers on the South Island. Photographed native parrots (kia) in the park.

6 March. Had food poisoning.

7 March. Drove south to Westland National Park, a large park of 117,547 hectares. This is a very wet area with up to 10 meters of rain per year. Hiked to the Franz Josef Glacier. This glacier once extended to the sea, but has been receding since 1865 and is now receding at the rate of one meter per day.

8 March. Still in Westland National Park, hiked to the Fox Glacier, which is receding much as is the Franz Josef.

Driving south, toured Mount Aspiring National Park. With 287,000 hectares, this park opened to travel in 1965. The results of glacial action are apparent throughout the park. Forests are mainly beech, with mountain beech in the drier areas (eastern slopes) and silver beech on the wetter western slopes. There is also an abundance of ferns and a wide variety of forest-dwelling birds and insects. Many hiking trails lead into the forests.

9 March. This day was spent touring the Wanaka area. This is an area of large, well-maintained sheep and cattle stations. Lake Wanaka is a glacial lake of over 300 meters depth. It is now subject to rapid increases in level due to unwise clearing of native vegetation in the surrounding areas. The City of Wanaka experienced severe flooding in December, 1984 and this problem exists throughout New Zealand. Many river beds show evidence of huge flood-stage flows. The government is trying to encourage reforestation to help control flooding.

10 March. Attended the Wanaka Agricultural Show, which is similar to the county fair of a small agricultural county in the United States. Special events included dressage and jumping competitions, sheep dog trials, and displays of the latest farm equipment.

Late in the day I traveled on to Queenstown, passing through sheep, cattle, and deer stations. (Deer are raised mainly for export of venison to Germany.)

11 March. At Queenstown, I toured the Deer Park Heights Animal Reserve. This reserve contains populations of the folowing introduced species: red deer, black fallow deer, Virginia deer, thar, chamois, mountain goats, waipiti, Persian deer, and white fallow deer. (All mammals in New Zealand are introduced; none are native.)

In the afternoon, I took the old steamer Earnslaw across Lake Wakatipu to Mount Nicholas Sheep Station. This is a modern, working sheep station of 50,000 hectares, running 20,000 sheep and 1,500 cattle. Many advanced methods are applied here. Helicopters are used for weed control and for fertilizing the grazing land. Sheep are shorn prior to lambing so ewes feel cold and seek shelter to lamb; thus fewer lambs are lost. Ewes are good for only 5 years in this harsh terrain as their teeth wear out. The dogs are also only good for 5 years as their feet wear out. There was an informative demonstration of sheep shearing and of dogs working sheep. I learned that the New Zealand sheep industry (the nation's main industry) would be impossible without dogs.

12 March. I visited the Cattledome near Queenstown, an educational facility similar to the Agrodome at Rotorua, but featuring cattle, rather than sheep. Many breeds of cattle are on display and presentations explain the New Zealand beef and dairy industries.

13 March. Drove west to Te Anau and Fiordland National Park. This is New Zealand's largest National Park, having over a million hectares (2½ million acres). Fiordland is very remote; much of it is still unexplored. There is

rainforest, alpine lakes, true fiords, and several very rare birds such as the takahe and kakapo. The lakes are the result of glacial action.

I took a boat across Lake Te Anau to Te Ana-au Cave. This is a living cave, meaning that it is still growing. Within this cave, in total darkness, visitors ride in pole-powered boats to view a large population of glow worms.

14 March. Took the all-day Fiordland "Triple Trip." In the first phase of this trip, passengers are carried by motor-launch down the length of Lake Manapouri, which was formed by glaciers about 15,000 years ago. Many unusual geological features are present, such as a glacial moraine at the eastern end of the lake, cliffs of conglomerate material (sand, gravel, and boulders fused together by the pressure of ice a mile thick on top), and wedge-shaped islands formed by glaciation.

The second phase of this trip is a journey down into the Manapouri Power Station. A bus winds down a 2.1 kilometer spiral tunnel into the powerhouse blasted out of solid granite 213 meters underground. Here 7 100,000 kilowatt generators provide electricity for the aluminum smelter at Bluff. The bauxite ore comes from Australia and the aluminum goes back to Australia, so this amounts to "exporting" the abundant hydroelectric power of the South Island. Water enters the turbines through a tunnel from Lake Manapouri and is discharged into Doubtful Sound.

The third phase of the triple trip is a boat cruise on Doubtful Sound, actually a fiord, but misnamed by Captain

Cook. (A fiord is formed by a glacier, while a sound is a sunken river valley.) Doubtful Sound has 300 kilometers of shoreline, bordered by luxuriant forest of beech and fern. Mosses, liverworts, and lichens are very abundant.

15 March. In Fiordland, National Park, I drove from Te Anau to Milford Sound. En route, the following were seen:

--New Zealand Government Farm Development project of 30,000 hectares. So far, 86 families have settled on newly developed (cleared) farms.

--Lake Gunn Nature Track. Hiked through red beech forest with heavy growth of mosses, liverworts, ferns, and lichens. Native birds observed included bellbird, rifleman, grey warbler, and others.

--Many glaciers.

--Evidence of avalanches, including snow avalanches and tree avalanches. The mountains in this area are basically solid rock with very little soil. Mosses grow first, then the beech root in the moss and form very shallow, tangled root systems. One day the whole mass simply slides down the mountain.

--Homer Tunnel. This tunnel is 7.4 meters in diameter and travels 2 kilometers at a 1:10 slope. Avalanches made construction very difficult.

--Many examples of glacial action.

--Milford Sound (not a sound, but a fiord; one of 13 in Fiordland Mational Park). Took a boat tour of the fiord out to the Tasman Sea. Many fur seals were observed on the

rocks bordering the fiord.

16 March. In Fiordland National Park, visited the Wildlife Bird Reserve. Birds seen included rare and common waterfowl, native parrots and parakeets, weka and takahe, and native pigeons. Plants included kauri, manuka, flax, and Dracophyllum oliveri.

In the afternoon, I traveled to Roxburgh, an agricultural community in the Central Otago region of the South Island. En route, I viewed especially well managed sheep stations and mature Pinus radiata being harvested. Wheat was also being harvested. Roxburgh is a fruit growing and canning center and wool producing area.

17 March. Viewed and photographed the Roxburgh Hydro-electric plant, damming the Clutha River, and forming Lake Roxburgh, 32 kilometers long. Power output is 320 megawatts.

Toured Alexandra, New Zealand's hottest, coldest, and dryest place, where temperatures range from -12 to 37 degrees Celsius and average annual rainfall is only 325 mm. Photo-graphed rangeland over-run by rabbits and currently the center of a controversy. Current rabbit control efforts, of only modest success, involve using 1080 poison. The proposed use of Myxomatosis virus for rabbit eradication is meeting opposition from animal welfare organizations.

Photographed Cromwell Gorge, the scene of a massive hydroelectric project now underway. This project will include 5 new dams and lakes, provide an abundance of electricity, and will provide irrigation for new fruit-growing areas. Note:

New Zealand strives to obtain the absolute maximum benefit from all natural resources. Even the smallest streams are dammed and used as sources of electricity. Very little original vegetation remains as most has been replaced with more productive range grasses or cultivated forest.

18 March. Traveled to Dunedin, New Zealand's oldest large city, founded in 1847. Dunedin is now a center for butchering, freezing, and shipping meat overseas. It is also a major wool processing and shipping area and the harbor for much commercial fishing. Hydroelectric projects provide 200 gigawatt hours of power per year. 10,000 hectares of cultivated pine forest surround the city. Dunedin offers many natural history attractions such as the world's only easily accessible albatross breeding colony.

19 March. Visited the University of Otago at Dunedin, New Zealand's first university. Having been at the current site since 1878, the University how has 7000 students. This is one of only 2 places in New Zealand where microbiology is taught as a separate discipline. I toured lecture and lab facilities in the 8-story Microbiology Building and interviewed Professor M. W. Loutit, Department Chairman. Most of the day was spent at a symposium on biotechnology being held in the Microbiology building and sponsored by the Microbiology Department. Speakers represented many departments of the University and presented much information that is proving to be valuable in the courses I teach.

20 March. Toured the Portobello Marine Station on Otago

Peninsula near Dunedin. I observed research projects on management of existing marine resources, development of new wild stocks of exotic species, improvement of aquaculture methods, and new uses of marine organisms and substances. For example, they are screening chemicals derived from sponges and bryozoans for antiviral and antineoplastic activity. About 1200 chemicals have been tested and 18 show some promise in terms of safety and effectiveness.

Driving fruther out Otago Peninsula, I visited the Tairoa Head Royal Albatross Colony, the world's most accessible royal albatross breeding site. It is only a 1 hour drive from Dunedin and a short hike from the road. These birds have an 11 foot wingspan and lay only one egg every second year. They require 9 years to reach maturity and one bird in the colony is known to be at least 56 years old. I was able to photograph several adults and several chicks.

21 March. I visited the Dunedin Botanic Garden, a large garden of about 2 square kilometers. I photographed very complete displays of well-labeled native and exotic plants and an aviary of native birds.

Toured the Otago Early Settler's Museum at Dunedin, with its extensive collection of artifacts relating to the daily lives of the people who settled this region from 1848 to 1898. Featured in the collection are implements of agriculture, mining, and transportation.

En route to Omarama, I stopped to photograph the Moeraki Boulders, perfectly round, 2 meter stones formed on the ocean

floor some 60 million years ago by ionic attraction. They have subsequently been revealed by upheaval of the earth.

I also photographed portions of the Waikati River Power Scheme, where 8 dams, lakes, and hydroelectric plants produce over 1700 megawatts of electricity. The Benmore Dam generates both AC and DC, the latter transmitted by cable at 500,000 volts under the Cook Strait to the North Island.

22 March. Spent the day at Mount Cook National Park. Took several interpretive bush tracks explaining the physical and biological features of Mount Cook National Park. Viewed the Tasman Glacier, 27 kilometers long, an average of 1.8 kilometers wide, and up to 600 meters deep. The glacier moves 30-45 centimeters per day and groans and banging sounds are evident. It is losing 0.5 percent of its volume annually.

23 March. Drove to Christchurch. En route, toured more of the Waikati River Power Scheme where the water has a milky color due to glacial sediment. Passed through arid sheep land, cultivated Pinus radiata forests, and irrigated dairy land.

24 March. At Christchurch, I visited the Canterbury Museum, among New Zealand's best museums. There are complete displays on the natural history of the area and the impact of European settlers on the environment, exhibits on Maori culture, and the outstanding Hall of Antarctic Discovery.

Photographed the Christchurch Botanic Gardens, established in 1863. The gardens contain many fine mature specimens of native and exotic trees and display collections of many

genera of plants, arranged by genus, with notes on the origin and characteristics of each group.

25 March. Visited the University of Canterbury. This is a new (2975) campus, located outside of Christchurch in the small town of Ilam. The emphasis is on engineering, fine arts, and agriculture. There is no microbiology department, but Dr. Tony Cole of the Botany Department offers a general microbiology course similar to our course 1. I interviewed Dr. Cole.

26 March. Flew to Sydney, New South Wales, Australia.

27 March. For orientation to Sydney I took a morning coach tour of the city.

In the afternoon I visited the Royal Botanic Gardens, the second oldest botanic gardens in the Southern Hemisphere. It contains many fine, mature specimens of native and introduced plants. Note: In both Australia and New Zealand, one is impressed with the much greater prevalence and quality of botanic gardens in contrast to the United States.

28 March. Toured the Australian Museum. This excellent museum has fine exhibits on native birds, mammals, reptiles, insects, and marine life as well as the unique geology of Australia. There are outstanding new exhibits on fire ecology (bush fires are a major problem in Australia) and on the Aborigines. The latter exhibit traces the complete history of these people from about 40,000 years ago until the present. It provides a good insight into the current conflicts in interethnic relationships in Australia today.

In the afternoon I visited the Botany and Zoology Departments at Sydney University. I talked informally with staff members in each department, learning how all Australian public universities are federally funded in a manner similar to New Zealand. The Australian system of colleges (high schools) and universities is similar to that of New Zealand, though private schools are more prevalent in Australia. I also discussed places of biological interest that I should be sure to visit while in Australia.

29 March. Took the ferry across Sydney Harbor to the fine Taronga Zoo. This zoo provides an excellent introduction to Australian birds, mammals, reptiles, and marine life. It contains the world's finest collection of Australian fauna and features many skillful display methods such as the use of very dim lighting for nocturnal animals so visitors may view their activities during the daylight hours.

30 March. Returned to the Australian Museum and spent more time in the New Guinea section with its outstanding displays of anthropological material.

In the afternoon, heading north from Sydney, I drove through the extensive Ku-Ring-Gai Chase National Park, which is preserving natural gum forest habitats in an area of intense development.

31 March. Toured and photographed the Brisbane Water National Park, preserving seashore and bush habitats, native gum forest, and native birds.

1 April. En route to Canberra, passed through pine tree

plantations similar to those in New Zealand. Saw much damage from recent bush fires, illustrating the controversy over proper fire management. As in California, experts warn that letting brush overgrow by controlling fires only leads to bigger and worse fires later on. Also, many of the native plant species only germinate when their seeds are exposed to flame.

2 April. In Canberra, Australian Capital Territory, the nation's capital, I toured Parliament and some of the foreign embassies.

I visited the Australian National University, founded in 1946 as strictly a research institute, with undergraduate programs added in 1960. The emphasis is still heavily on research as 400 staff members do both teaching and research while 800 do research only. I found more separation of the two functions (teaching and research) than is typical of most universities. For example, there are two biology buildings and departments (one strictly for research), two chemistry buildings and departments, and so on. I was disappointed to find that the Institute of Anatomy, which had featured excellent displays on human biology, had been closed and the building occupied by a film museum.

I toured the National Botanic Gardens, adjacent to the University, featuring 41 hectares of strictly Australian flora. All major Australian plant groups are represented.

3 April. Outside of Canberra, I toured the Tidbinbilla Tracking Station and associated Canberra Space Center. This

is the site of several large antennae which receive signals from space vehicles. It is operated by the Australian Government in conjunction with the United States NASA and Jet Propulsion Laboratories.

Only a few kilometers away I toured and photographed the Tidbinbilla Nature Reserve, probably the best of its type. With an area of 5510 hectares of gum forest and 40 kilometers of hiking trails, there are established breeding populations of platypus, echidna, koala, red and grey kangaroos, wallaroos, and wallabies (Figure 4). Among the hundreds of bird species breeding here are emu, cockatoos, gallahs, lorakeets, lyre birds, and crimson rosella.

4 April. En route to Melbourne, I passed through native Eucalyptus forests and cultivated Pinus radiata stands as well as sheep and cattle range and several state and national parks.

5 April. Still en route to Melbourne, I traveled through an area noted for having earthworms 2 meters long, but was unable to find any, possibly due to stormy weather.

6 April. In Melbourne, I visited the National Museum. I studied extensive exhibits on the natural history of Australia and Aboriginal history and ethnology. I also toured the nearby National Gallery, an immense, modern building housing Australian and overseas art with a special collection of Aboriginal art.

7 April. Traveling to Phillip Island, a wildlife preserve, I viewed and photographed koalas (Figure 5) in their

natural habitat and saw the nesting area of over 2000 fairy penguins. Each evening, these penguins can be observed returning from a day at sea and walking up the beach to their nests.

8 April. Toured Wilson's Promontory National Park, a large wildlife refuge with 130 kilometers of shoreline. Species seen and photographed included kangaroos, koalas, wombats, emus, and many other land and sea birds. The park also contains good examples of gum forest, grassland, and sand dune habitats.

9 April. I visited the University of Melbourne, founded in 1854 and the first in Australia to admit women. There are about 20,000 students. At the Microbiology Department I interviewed Professor N. F. Millis, an expert on water microbiology. We discussed special problems in sewage treatment and management of scarce water resources in Australia.

10 April. Visited the Royal Botanic Gardens, one of the finest on earth. Photographed a fine collection of Australian and introduced plant species.

Drove north to rural northwest Victoria, near Ararat, to begin a 3 day stay on a working sheep station. In the evening I skinned a kangaroo that had been shot to feed the dogs. Note: Millions of kangaroos are killed each year by Australians who believe that the number of kangaroos is inexhaustible. My impression is that some species of kangaroos will become rare or even extinct if hunting is not reduced.

11 April. Assisted in the daily routine activities of the

sheep station. Found the sheep to be in very poor condition due to lack of forage as a result of overgrazing and drought conditions. Each day, some sheep died of starvation. I learned that both sheep and cattle graziers are having a difficult time because of drought and low prices. A good milk cow and her calf had just been purchased by the station for $A18 ($US12). Many other aspects of sheep production were learned. I was surprised to find that they do not use artificial insemination, but simply run rams with the ewes, the optimum being 2½ percent rams.

12 April. Toured the Grampions National Park. This was formerly a State Park, becoming a National Park only a few months before my visit. With an area of 176,000 hectares, it holds a rich variety of native birds and mammals and Aboriginal rock art, painted on uplifted sandstone sediments. 860 native plant species have been identified in the park, along with kangaroos, koalas, echidnus, possums, and over 200 bird species.

13 April. Drove further north to Mildura, Victoria. Passed through hot, arid grazing land and dryland grain farms. Mildura is a prosperous area of irrigated citrus and vinyards, located on the Murray River and planned by the Chaffey brothers from Canada, who also founded Ontario, California.

14 April. Drove down the Murray River toward Adelaide. Observed an elaborate irrigation scheme including 26 dams and locks on the Murray River. Passed through extensive areas of irrigated orchards and vinyards.

15 and 16 April. Spent two days touring and photographing the Barossa Valley north of Adelaide. Studied Australian methods of viticulture and enology.

17 April. Drove to Adelaide, passing through areas of vinyards, orchards, and vegetable farming.

18 April. Toured and photographed the Cleland Conservation Park near Adelaide, South Australia. The following were viewed and photographed in their natural habitats: red kangaroos, western gray kangaroos, wallabies, wombats, koalas, dingoes (Figure 6), emus, ibis, cormorants, Cape Barren geese, and many other species of birds. Found the best selection of books on Australian wildlife of anywhere I visited in Australia.

19 April. Visited the University of Adelaide. Located in the heart of the city, this campus is charcterized by old buildings and a relatively small student body of about 3000. I toured the Microbiology, Anatomy, Physiology, and Pathology Building and interviewed Professor William Henley.

Adjacent to the University, I toured the South Australian Museum, housing the largest Aboriginal collection in the world. There is also an extensive Melanesian collection and comprehensive displays on Australian birds and minerals.

20 April. In the morning I toured the Adelaide Botanic Gardens, 16 hectares of Australian and exotic plants. Many unusual species are housed in greenhouses here.

At noon I departed for Perth, Western Australia, aboard the train "Trans Australian."

21 April. Aboard the Trans Australian traveling across the Nullarbor Plain. This prehistoric seabed is today hundreds of kilometers of sparce grass and an occasional shrub, but no trees of any kind. On the plain, I saw hundreds of kangaroos (red and grey), eagles, and rabbits. Because of the flat terrain, this is the longest straight railroad track in the world: 478 kilometers without a curve.

22 April. Arrived at Perth in the early morning, rented a car, and headed north. Visited the Yanchep National Park en route to Cervantes. Yanchep contains abundant wild kangaroos, emus, and black cockatoos and a captive koala colony.

23 April. At Cervantes, a tiny fishing village on the Indian Ocean north of Perth. Toured and photographed the Nambung National Park, home of several species of Banksia, grey kangaroos, emus, and many sand dunes, both naked and stabilized with vegetation. A most unusual feature of the park is the pinnacles, conical sandstone formations 1-4 meters high. They were formed by calcification of the root zones of prehistoric bushes and subsequent exposure by wind erosion of the surrounding non-calcified sand.

24 April. North of Cervantes, I toured the Nyalgarda Bird Park and Shell Museum. A large collection of Australian birds, along with some overseas birds, is displayed in large aviaries in a natural bush setting. Also displayed is a large collection of shells and crustaceans from the nearby Indian Ocean coast of Western Australia.

Driving further north, I toured Jurien, the center of the Australian marine crayfish industry (Palinuris vulgaris). These large crayfish are harvested in a manner similar to the United States Maine lobsters. Basket-like traps are baited with heads of salmon or other fish and marked with coded buoys. These crayfish appear in U. S. restaurants as "lobster tails."

25 April. En route to New Norcia, Western Australia, I passed through the Badgingarra National Park, set aside for the preservation of native plants and animals. This park is mainly bushland and Banksia.

New Norcia was founded in 1847 by Benedictine monks as a mission to the Aborigines. The monks now operate two private colleges (equivalent to our high schools), one for boys and one for girls. There is an excellent museum of Aboriginal culture and early Western Australia farming methods.

26 April. Toured the agricultural areas northeast of Perth. I saw wheat farming and sheep and cattle stations. I also stopped to explore several flora and fauna reserves.

27 April. Cruised up the Swan River to Sandalford. Viewed many historic and contemporary landmarks along the river and many species of waterfowl. At Sandalford, I learned about Western Australian grape varieties and techniques of viticulture and enology.

28 April. Took an old narrow-gauge train (the Australind) south of Perth to Bunbury. En route, the train passed through citrus and dairying areas, sheep stations, and horse ranches.

Bunbury is a major port for shipping bauxite, forest products, and wheat and for importing petroleum and fertilizers.

30 April. In the morning I visited the University of Western Australia, a fine, modern campus between Perth and Fremantle. I interviewed Professor Morgan Price of the Microbiology Department. He is attempting to isolate antimicrobial drugs from several species of little-known fungi.

1 May. Flew to Alice Springs, Northern Territory, in the outback near the very center of Australia. I visited the Alice Springs School of the Air, one of 12 in Australia. Using 2-way radios, these schools provide primary education for children in remote areas. the entire class "meets" by radio 5 days a week, while each student gets a private session once a week. The teacher goes to the home of each student once a year, using a four wheel drive vehicle or a light airplane.

2 May. Toured the Pitchi Ritchi Sanctuary, central Australia's largest outdoor museum. Of special interest are sculptures by William Ricketts portraying Aboriginal culture. In addition, there are extensive displays of historic outback farming, mining, and transport equipment. Many species of birds live in this protected environment.

Drove to the Ewaninga Rock Carvings Conservation Reserve, where prehistoric Aboriginal stone carvings are being preserved. Interpretive signs explain Aboriginal culture, nomadic lifestyle, and uses of native plants.

3 May. Drove rented car into remote outback areas observing and photographing the desert flora and fauna.

4 May. Attended the Outback Tall Tales Contest at Alice Springs, gaining insights into Australian culture and outback life.

5 May. Began 9 day "Bill King Four Wheel Drive Outback Adventure Tour." Equipment used was 20 passenger Bedford four wheel drive bus.

Toured the Western MacDonnell Ranges. These mountains run east and west of Alice Springs, are about 350 million years old, and exhibit much unusual geology. Specific places visited included:

--Standley Chasm, the world's oldest true chasm.

--Ellery Big Hole, an 80 meter deep waterhole eroded into quartzite by Ellery Creek.

--Serpentine Gorge, eroded through the quartzite by Serpentine Creek.

--Ochre Pits, deposits of iron oxides used by Aborigines for face paint and in other art forms.

--Finke River, said to be the world's oldest river in its current channel.

--Glen Helen Gorge, eroded by the Finke River across layers of sedimentary rock. A permanent waterhole with black swans and other waterfowl present.

6 May. Visited Gosses Bluff. 130 million years ago a comet hit here, leaving the world's second largest crater, 20 kilometers in diameter.

Entered Palm Canyon a wide gorge cut through sandstone by the Finke River. Palm Valley contains two rare native

plants, the *livistonae* palm tree and the MacDonnell Ranges cycad.

Stopped at the Hermannsburg Aboriginal Reserve, a Lutheran Mission to the Aborigines from 1877 to 1967 and still home for many Aborigines.

Last stop of the day was Simpson's Gap, where Roe Creek has eroded a gap through the quartzite. This is the home of a colony of rock wallabies.

7 May. Toured the Eastern MacDonnell Range. First stop was Emily Gap Nature Reserve, a reserve for native flora and fauna. Next was Corroboree Rock, formerly a highly sacred Aboriginal site, where rock paintings can still be found. At Trephina Gorge Nature Park I observed an abundance of birds of many species and several species of lizards.

8 May. Participated in Rod Steinert's Dreamtime Tour. (Dreamtime is the religion of the Aborigines. It features reincarnation, with the time between incarnations being spent in Dreamtime.) This one-day tour visits an active Aboriginal bush settlement outside of Alice Springs. This is one of the few places (actually, the only place I know of) where it is acceptable to photograph Aboriginal activities (Figure 7). Many Northern Territory Aborigines, including the people at this site, still live a fairly traditional nomadic life style. Here, one can observe traditional nomadic shelter, food gathering methods, tool and weapon making, and other daily activities. I sampled Aboriginal food items such as witchetty grubs, dug from the roots of mulga bushes. I heard explanations

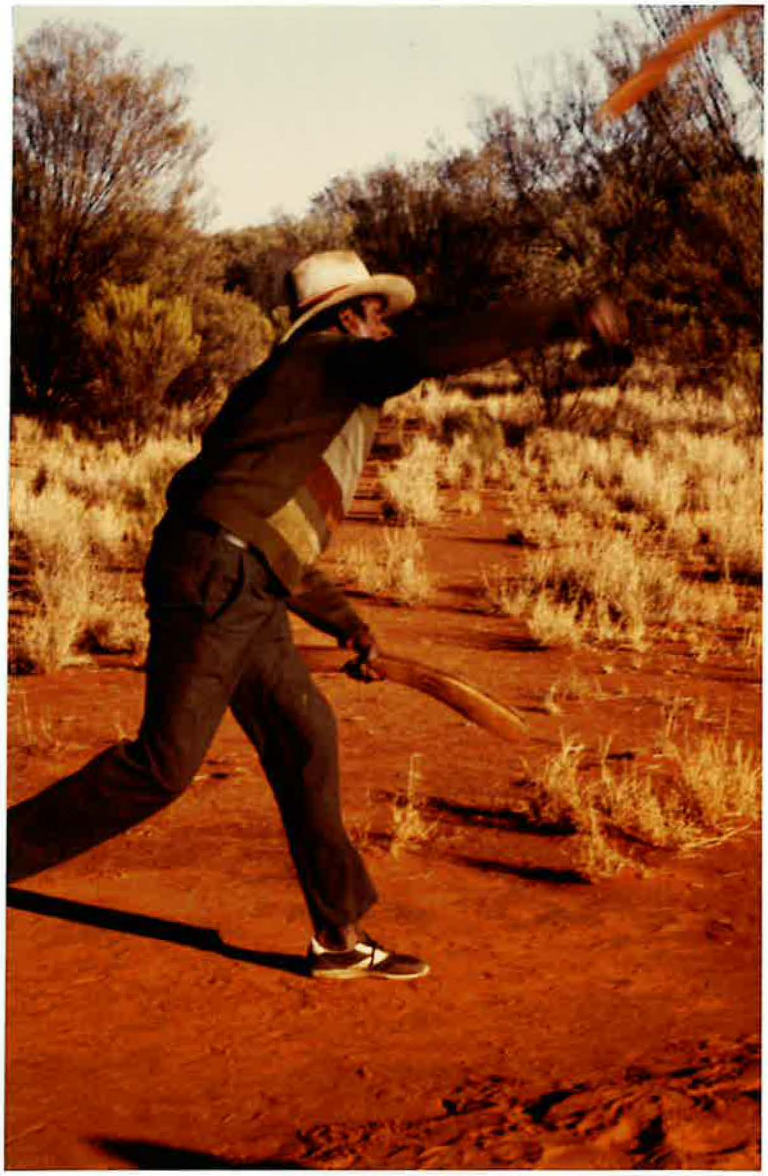


Figure 7. Demonstration of Aboriginal hunting techniques near Alice Springs, Northern Territory.

of traditional tribal, kinship, and family customs and taboos. Future possibilities for the Aborigines were also discussed.

9 May. Traveled south from Alice Springs with Bill King's Outback Tour to King's Canyon, a gorge cut through the George Gill Mountain Range by King Creek. En route I viewed and photographed dingos, eagles, and other birds and wildlife. The driver gave informative lectures on the trees and other vegetation of the area.

10 May. Continued on to Ayer's Rock and the Olgas Mountains. While near to each other, these formations are quite different geologically. Ayer's Rock is sandstone and is the world's largest stone. Its circumference is 8.8 kilometers, its height 948 meters, and it extends thousands of meters into the earth. The Olgas are a conglomerate of small rocks, embedded in sandstone. Much Aboriginal lore is associated with each area, and many sites are held sacred. Both are now Aboriginal property and have been leased back to the government for operation as Uluru National Park. The correct Aboriginal name for Ayer's Rock is Uluru, while the Olgas are called Katatjura. The driver-guide explained the geology of the area and told Aboriginal beliefs about this sacred place.

11 May. Made an early-morning climb of Ayer's Rock and took a ranger-guided walk around its base. Returned to Alice Springs in the evening.

12 May. Visited the original site of the town of Alice Springs, now a historic and wildlife preserve as a National Park. Here I learned about the early exploration of Australia

and other historic information.

Late in the day, I flew to Cairns in Northern Queensland, the gateway to the Great Barrier Reef (Map 4).

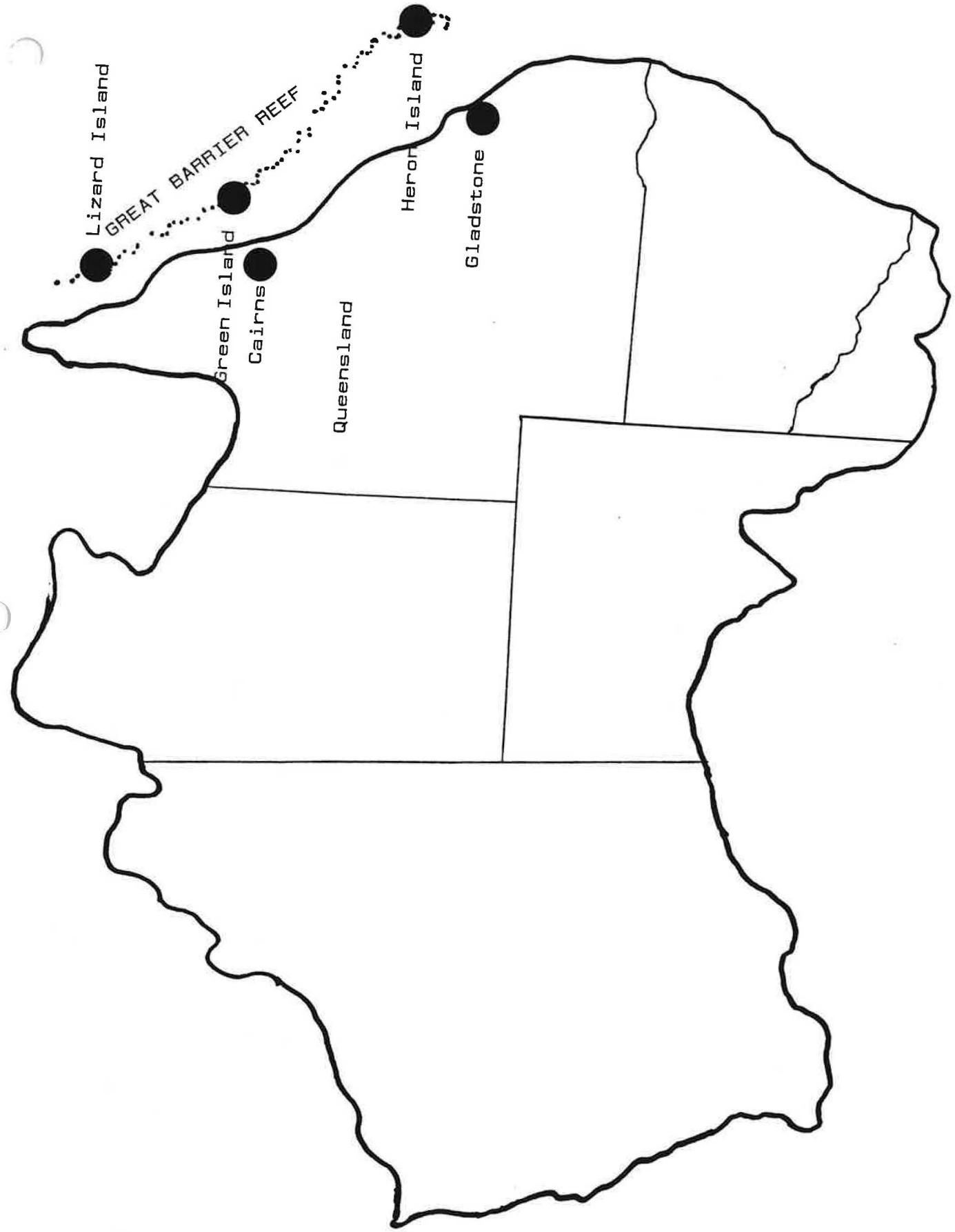
13 May. Traveled by boat to Green Island, a true coral cay, an actual part of the Great Barrier Reef. This is a small island of 1.6 kilometer circumference. Most of the island and all of the surrounding reef are preserved as Green Island National Park. In the evening, I viewed films on the Great Barrier Reef.

14 May. Snorkeled over the Great Barrier Reef around Green Island. I found the coral to be in poor condition due to an earlier population explosion of the crown-of-thorns starfish. The reason for this explosion is not definitely known. I also took a naturalist-guided nature tour of Green Island.

15 May. Visited Marineland Melanesia on Green Island. This is an oceanarium with an excellent assortment of living reef organisms such as fish, sharks, turtles, and invertebrates. It also contains a large number of indigenous salt-water crocodiles, including the world's largest living in captivity. In addition, there is an extensive collection of Papua New Guinea artifacts.

I viewed historic films by Norm Monkman, the first person to apply the techniques of microcinematography to reef organisms.

16 May. On the low tide, I went reef walking on the Great Barrier Reef. I saw coral starting to recover from



Map. 4 Location of islands visited on Great Barrier Reef.

crown-of-thorns damage, but probably being again damaged by too many people reef-walking because of the easy accessibility of Green Island from the mainland. In the late afternoon I returned to Cairns.

17 May. Visited the Cairns Museum of the History of Northern Queensland, featuring displays on Aboriginal culture and early European settlers.

In the afternoon I flew north to Lizard Island, named for the 2 meter goanna lizards found by Captain Cook and still abundant on this little-developed island. Lizard Island is a continental island, but is surrounded by the Great Barrier Reef. It serves as a nesting site for herons and other sea birds. Its lush tropical rainforest is the home of many interesting tropical birds and insects.

18 May. Snorkeled over the Great Barrier Reef off Lizard Island. I found the reef here in very good condition. No crown-of-thorns were visible and there was no evidence of human interference with the reef, which is protected as Lizard Island National Park.

19 May. Another day of snorkeling over the reef. I saw giant clams (up to 450 pounds [200 kilograms]), many kinds of corals, anemones, starfish, octopus, and other invertebrates and many species of reef fish. In the evening I flew back to Cairns.

20 May. In the morning I took a train to Kuranda on the Atherton Tableland. I photographed many tropical plants and birds and visited the Aboriginal Art Center (this area has a

large Aboriginal population).

In the afternoon I rented a car and drove south to Mission Beach. This is considered to be one of Australia's most tropical areas. There are many small farms growing bananas, papayas, and other tropical fruits. There is a population of the rare, large, flightless cassowary bird here, though I was unable to find any of them.

21 May. In the early morning I hiked and photographed the rainforest at Mission Beach. This is Australia's area of greatest rainfall (8 meters [315 inches]) annually and one of few places in the nation where the rainforest still extends to the edge of the sea.

I studied the tropical agriculture of the area and visited the world's most mechanized tea plantation and processing plant. Tea (Camellia sinensis) is grown in low hedgerows and machine harvested 44 times a year. This plantation achieves the world's highest yield and world's lowest labor cost. The plants grow 8 mm per day.

In the afternoon I returned to the Atherton Tablelands, an area of rich farmland. In addition to some remaining virgin rainforest, there is pine forest, sugarcane, corn, tobacco, dairying, peanuts, rice, coffee, potatoes, alfalfa, passion-fruit, avocado, pecans, and many more crops.

22 May. I visited the Lake Barrine National Park, where I took a narrated wildlife boat tour around the periphery of the lake, learning about the ecology of the rainforest.

Further north, I visited Granite Gorge, near Mareeba. Here

I photographed many rock wallabies, then continued north to Port Douglas.

23 May. I continued north to Mossman and Daintree. At Mossman I toured the large, modern sugar mill, serving the extensive cane plantings of Northern Queensland. At Daintree I toured a coffee plantation, then participated in the "Daintree Wildlife Safari." This was a boat trip down the Daintree River, operated by a biologist who explained the plants and animals of the rainforest. Many crocodiles were basking on the river banks. I learned that all of the remaining rain forest in Australia, if put together, would form a circle of only 80 kilometers diameter.

24 May. A travel day. Traveled by car from Port Douglas to Cairns and by air on to Gladstone.

25 May. Traveled by boat to Heron Island, another true coral cay. This tiny island consists of only 20 hectares (46 acres) and has a maximum elevation of 3.3 meters. The island and surrounding reef are part of the Great Barrier Reef National Park and all life forms are carefully protected. It is the site of the Queensland University Marine Research Station and an important breeding area for two species of sea turtles, the green turtle, Chelonia mydas, and the loggerhead turtle, Caretta caretta. It is also an important breeding site for the following birds:

White-capped noddy tern (Anous minutus)

Wedge-tailed shearwater or muttonbird (Puffinus pacificus)

Reef heron (Egretta sacra)

Silver gull (Larus novaehollandiae)

Banded land-rail (Rallus philippensis)

Bar-shouldered dove (Geopelia humeralis)

Silver eyes (Zosterops lateralis)

26 May. Took a naturalist guided walking tour of the island. Saw nesting areas of sea turtles and above listed birds. Learned to identify native plant and bird species. I visited the Queensland University Research Station where I discussed current research projects with staff members. Snorkeled over the Great Barrier Reef (not as good here as at Lizard Island).

27 May. Spent the day hiking on Heron Island, photographing birds and vegetation. Did some additional snorkeling over the reef.

28 May. On the low tide, went reef walking with a naturalist guide who discussed reef ecology. Photographed coral and other reef animals (Figure 8).

29 May. Again went reef walking with naturalist guide. Unusually low tide revealed much of the reef. In the afternoon, I returned to Gladstone by boat.

30 May. Spent the day driving south toward Brisbane. Viewed gum forests, cultivated pine forests, grazing land, and tropical fruit orchards.

31 May. At Mount Coot-Tha Forest Park, hiked nature trails among approximately 2000 plant species, many of which were labeled.

At Brisbane, I visited the Lone Pine Sanctuary, home of many koalas, kangaroos, wallabies, emus, and other birds.

1 June. In the morning I visited the Queensland Museum, featuring excellent interpretive displays on the Great Barrier Reef and Aboriginal history and culture. I toured the Brisbane Botanic Gardens with its many labeled species of tropical and subtropical plants.

With my sabbatical at an end, in the afternoon I departed from Brisbane for home.

VALUE OF SABBATICAL TO MT. SAN ANTONIO COLLEGE

In addition to my personal benefits from this travel, I believe that my sabbatical leave will be of great benefit to Mt. San Antonio College in the following ways:

1. My travel through New Zealand and Australia has provided me with hundreds of specific examples I can use to illustrate the biological concepts included in my courses at Mt. San Antonio College.

2. I have acquired a library of 2160 35 mm color transparencies illustrating a wide range of biological concepts for classroom use. These slides are available to any instructor who wishes copies for his or her use (see Appendix).

3. I exchanged ideas with many professors in New Zealand and Australia. I acquired many interesting insights that will be of value in the courses I teach at Mt. San Antonio College.

4. I had considerable exposure to the Maori and Aboriginal cultures as well as the European cultures of New Zealand and Australia. This experience has improved my ability to relate to the many students at Mt. San Antonio College who represent

cultures that may be very different from my own.

5. I am planning a series of 3 slide-illustrated seminars for all college staff in which I will describe the habitats, wildlife, and current environmental concerns in Australia and New Zealand. In these seminars, other instructors will be made aware of the slides that are available for their use. I have already made two informal slide presentations to the Biological Sciences Department.

6. This sabbatical leave has revitalized my teaching at Mt. San Antonio College and given me a new appreciation of this unique educational institution.

CONCLUSION

I feel very satisfied with this sabbatical leave. My goals and expectations were more than fulfilled. Every day was rich in new experiences, knowledge, and insights. Even though I was busy from early morning to late evening, seven days a week, I never lost interest in these two fascinating countries. There was no place I visited where I did not leave with the feeling that my time had been well spent there. I am eager to return and continue my exploration.

APPENDIX: TRANSPARENCIES AVAILABLE

All instructors at Mt. San Antonio College are welcome to use or copy any of the 2160 35 mm color transparencies taken during this sabbatical. I may be contacted at any time at Building 13, Room 15 or on extension 553 to arrange the loan of slides.

General categories of slides available include:

1. Varied habitats and life zones such as rain forest, desert, seashore, and grassland.
2. Reforestation where native forest has been removed.
3. Agricultural methods, including livestock production and various crops.
4. Geothermal production of electricity.
5. Hydroelectric projects.
6. Wildlife of New Zealand and Australia.
7. New Zealand Maori and Australian Aboriginal people in contemporary activities.
8. Wildlife refuges in New Zealand and Australia.
9. Botanic gardens in New Zealand and Australia.
10. Unusual geological formations in New Zealand and Australia.
11. Coral and other organisms of the Great Barrier Reef.
12. Classic and contemporary architecture of New Zealand and Australia.
13. Glaciers, fiords, and similar features.
14. Human environmental mismanagement (overgrazing, erosion, etc.)

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