

24/1976

THE AUSTRALIAN NATIONAL UNIVERSITY
RESEARCH SCHOOL OF PACIFIC STUDIES

DEPARTMENT OF BIOGEOGRAPHY AND GEOMORPHOLOGY

ANNUAL REPORT 1975

Academic Staff

Professor of Biogeography
and Head of Department

D. Walker, B.Sc. (Sheff.),
M.A., Ph.D. (Cantab.)

Professorial Fellow in
Geomorphology

J. N. Jennings, M.A., Ph.D. (Cantab.)

Senior Fellows

G. Singh, B.Sc., M.Sc. (Punjab),
Ph.D. (Lucknow), Ph.D. (Belfast)

N. M. Wace, M.A. (Oxon.),
Ph.D. (Belfast)

Fellow

J. M. Bowler, B.Sc., M.Sc. (Melb.),
Ph.D. (ANU)

Senior Research Fellow

B. G. Thom, B.Sc. (Syd.),
Ph.D. (Louisiana) (to 30 Nov. 75)

Research Fellows

J. R. Flenley, M.A. (Cantab.),
Ph.D. (ANU) (from 15 Aug. 75)

R. F. McLean, B.A., M.A. (N.Z.),
Ph.D. (McGill)

J. Ogden, B.Sc., M.Sc., Ph.D. (Bangor)

C. D. Ollier, B.Sc., M.Sc., D.Sc. (Bristol)
(from 8 April 75)

Postdoctoral Fellow

J. E. Ash, B.Sc. (Sus.), Ph.D. (E. Anglia)

Queen Elizabeth II Fellow

G. S. Hope, B.Sc., M.Sc. (Melb.),
Ph.D. (ANU)

Research Assistants

D. Cooke, B.Sc. (Melb.)

Elizabeth Geissler, B.Sc. (ANU)*

Lynette R. Griffith, B.A. (Monash)

Joan C. Guppy, B.Sc. (Adel.)*

Daphne Moss, B.Sc. (Reading)*

* Part-time appointments

The role of the Department

The Department is mainly concerned with the physical and biological components of the human environment. Their expressions at present and during the Quaternary past are equally investigated with special concentration on the most recent 50,000 years. Within the Research School, association is closest with the Department of Prehistory and there are elements of interest in common with the Departments of Anthropology and of Human Geography. Beyond, there is considerable co-operation with members of the Research Schools of Biological Sciences and Earth Sciences, with the Departments of Prehistory and Anthropology, of Geography and of Geology (SGS) and with the Centre for Resource and Environmental Studies, as well as with appropriate units of CSIRO.

Most of the Department's work lies in the investigation of fundamental processes of geomorphic and vegetational change with some concern for the implications of the collected data for indicating the course of climatic events and the impact of human activities. Individual members of the Department are called upon to advise on environmental issues with increasing frequency.

Field research is carried out on the Australian continent and in Tasmania, in Papua New Guinea, on small South Pacific islands and to a limited extent in New Zealand.

Visitors

The Department continues to profit from the association with it of Dr A. E. Costin. Dr R. J. Eyles (Victoria University of Wellington, New Zealand) completed a nine-month visit in August. Professor R. G. Barry (University of Colorado, Boulder, USA) spent the last half of the year in the Department. In addition, it is a pleasure to record shorter visits from many Australian scientists as well as the following from overseas:

Professor J. Bauch, University of Hamburg, Federal Republic of West Germany.

Professor M. C. Brown, University of Alberta, Edmonton, Canada.

Professor R. Fairbridge, Department of Geology, Columbia University, New York, USA.

Mr R. J. Johns, Department of Forests, PNG.

Dr B. Kennedy, University of Manchester, UK.

Dr M. Muir, British Museum (Nat. Hist.), London, UK.

Dr F. Oldfield, University of Lancaster, UK.

Dr I. B. Pavlin, Elektroprojekt, Zagreb, Yugoslavia.

Dr N. J. Shackleton, University of Cambridge, UK.

Dr H. F. Steedman, Bath University, UK.

Dr D. R. Stoddart, University of Cambridge, UK.

Mr B. Stevenson (University of New South Wales) held a Vacation Scholarship in the Department from 14.12.74 to 23.2.75 and, partly on the basis of the work he carried out, was awarded a First Class Honours degree in 1976.

Research Students

Mr R. J. Hnatiuk returned to the Department briefly early in the year and successfully completed his Ph.D. thesis. Mr J. Dodson and Mr E. C. Nelson submitted their theses, which were duly approved for the Ph.D. degree, and left the Department. Mr R. C. Buckley (UK), Mr R. Corlett (UK), Mr N. Enright (WA) and Mr E. Rhodes (USA) joined the Department. Miss J. Lundberg transferred to candidature for the M.Sc. degree.

Research

The most striking new developments during the year included the development of studies in the reproductive strategies of trees in relation to the overall processes of vegetation change, work which has direct practical importance for land use planning as well as being central to the development of ecological theory. Drs Ogden and Ash have made substantial investigations in the montane forests of Tasmania and Papua New Guinea respectively, the first with special reference to Arthrotaxus cupressoides and A. selaginoides, the second to species of Nothofagus. Mr Enright has begun work of a similar nature amongst the Araucaria species of Papua New Guinea whilst Mr Corlett's study of the dynamics of the forest-grassland boundary on the high mountains of that country contributes to the same general field.

The need to establish the ages of tree populations has led to an interest in tree ring studies and to their use as records of past climate. The Department has taken the lead in organising the assessment of Australian trees and environments for dendroclimatological studies by inviting Dr Ferguson of the Tree Ring Research Laboratory of the University of Arizona to visit during 1974 and, by association with CRES, ensuring a longer visit by Professor V. C. La Marche of the same institution beginning in December. Dr Ogden's material from Tasmania, comprising cores or segments of some 500 trees, has been prepared for study and will form a significant basis for tree growth and climate (drought and temperature) histories spanning at least the past 1000 years. The laboratory equipment for this purpose has been purchased but awaits connection to the Joint Schools' computer.

This development of a potential major contribution to climatic studies came at a time of greater explicit involvement in this field than has been usual in the Department. Invitations to summarize knowledge about the Quaternary climate of Australia and New Guinea to international conferences in Norwich (UK) and Melbourne led five members of the Department to prepare a critical synthesis and review, much of the material for which had been accumulated by its present and former members. Professor Barry visited specifically to carry out research on the climate of Papua New Guinea's high mountains about which the Department has gathered a good deal of information in the past. Professor Walker was a member of an Academy of Science committee appointed to advise the Australian Government on aspects of climatic change. The year has therefore proved a time of assessment of the Department's place in climatological research which in turn is leading to the definition of the most useful contributions which it might make to this field in the future.

Another new development was signalled by Dr Ollier's arrival in the Department with his interests in volcanic landscapes and the influence

of major forces associated with continental drift on geomorphic events. His main field work will be carried out in New Guinea, where he has already visited Woodlark Island, Indonesia and Malaysia.

New developments are possible only by the completion of other projects. The drilling programme associated with studies of Quaternary land- and sea-level change, which has figured largely, albeit profitably, in the Department's budget for almost four years, was virtually completed by December. Dr Thom, for whom it has been the basis of his main study, has already taken opportunities offered by conferences to expose his preliminary syntheses of the data whilst Mr Rhodes still requires a second period of field work on the eastern shores of the Gulf of Carpentaria and numerous laboratory analyses of collected material.

Beach form changes at Moruya (NSW) have now been measured at fortnightly intervals for the last four years by Drs McLean and Thom and will be discontinued. This investigation has provided the longest series of such frequent observations yet available in Australia and ranks amongst the longest in the world. The total data still await analysis and interpretation in terms of geomorphic process theory and the origin of the forces mainly responsible for change, but already their practical value has been recognised by coastal protection engineers.

Another piece of work to leave the data collection phase and enter on analysis is Dr Wace's study of the car-borne flora of Canberra. Regular monthly sampling of mud from car-wash tanks ceased after August but the tedious process of growing the extracted seeds for identification has continued until the end of the year, more than 200 species now having been determined.

Finally, the very extensive and important field work at Lake Mungo (NSW) which led to the discovery of the oldest dated human remains in Australia and has had repercussions in a number of associated disciplines, is now, to all intents and purposes, complete. Dr Bowler is currently writing up the details of his stratigraphic, sedimentological and chronological findings and testing their implications for climatic change and the history of the human environment. Mr Dare-Edwards' study of the development of soils of a variety of ages in this currently semi-arid region has now entered the laboratory phase.

Some research programmes of long-standing continue to prosper, to yield valuable results and generate new ideas. Dr McLean continues his analysis of the evolution of reef islands in relation to sea level change on the Great Barrier Reef and on the role of storms in building atoll islands, particularly in the Ellice Islands. He has also collected data on coastal progradation in New Zealand during the last 100 years and on the nature and rates of Holocene sedimentation and sea-level change there. Dr Jennings' experimental work on karst hydrology and on nivation processes, both in the Snowy Mountains of NSW, progresses despite problems of year-round access and maintenance of field instruments. Miss Lundberg is conducting research into processes associated with the development of tropical karst at Chillagoe in North Queensland.

For the time being at least, the emphasis in the work on Quaternary vegetation history has shifted from Papua New Guinea to Australia. For those still primarily concerned with tropical vegetation studies,

particularly Professor Walker and Dr Hope, it has been a year of data analysis and writing, although Dr Hope has collected some new pollen-analytical material from Telefomin and the Star Mountains as well as making vegetation descriptions of subalpine and alpine parts of Mt Scorpio and Mt Albert Edward. Mr Garrett-Jones' pioneering work in lowland Papua New Guinea has established a mud sequence at Lake Wanum in the lower Markham Valley extending back more than 10,000 years in which major sedimentary changes and a more-or-less continuous pollen-analytical record are evident. Professor Walker made detailed plans for a major new project in lowland Papua New Guinea which had to be abandoned when the financial prospects for 1976 became apparent.

Dr Singh has brought work at Lake George (NSW) to the stage where an outline vegetation history for perhaps the last 100,000 years has been established, although the details of its chronology are subject to further study. It seems, however, that in the long sequence of oscillations between woodland and treeless vegetation, dry sclerophyll vegetation first appeared in the area only about 6000 years ago; the relative significance of climate and human activity in determining this circumstance are open to speculation. Dr Singh is also progressing in the refinement of the pollen-analytical technique. At Bega Swamp, NSW he successfully froze a monolith of sediments which was subsequently cut into horizontal wafers, each 5 mm thick and vertical sections impregnated with polyester resin. The former will eventually allow the sampling of the site at decade intervals and the latter will facilitate the identification of secondary penetration, the exact location of charcoal layers and so on.

Mr Nelson completed his work on the taxonomy and distribution of Adenanthos (Proteaceae) and Mr Buckley began a study of the factors affecting plant distribution on dunes and swales in central Australia, notably around Ayers Rock and Andado Station. Dr Wace has continued his study of the naturalised flora of Australia, has completed a work on oceanic island resources and their rational use and conservation and another on climate and vegetation of the islands of the Southern Ocean, and has begun experimental work on the suitability of some New Zealand and Australian plants for introduction into Tristan da Cunha. He is also compiling a vegetation and flora of the Nuyts Islands, SA.

Dr Ogden, on a private visit to Europe, completed work begun some years ago on the ecology and life history of Tussilago farfara (Compositae). Dr Hope completed his own parts of a volume on the natural history of Mt Carstensz, Irian Jaya, and helped edit the rest of it, whilst Dr Flenley devoted most of his time to writing a book on tropical vegetation history. Dr Jennings, in collaboration with Professor J. A. Mabbutt (University of NSW), prepared a new physiographic map of Australia.

Other activities

Dr Thom took up a Senior Lectureship in Sydney University, Mr Dodson a Lectureship in Canterbury University (NZ) and Mr Hnatiuk a post at the Western Australian Herbarium.

Shortly after joining the Department, Dr Ollier was awarded the D.Sc. degree of Bristol University (UK).

During the year 21 seminars were given in the Department by its

members and visitors. Members of the Department also contributed to seminars in other parts of the University and lectured to the following institutions and conferences:

Australian Conference on Climate and Climatic Change (Hope, Thom)
Cambridge Quaternary Discussion Group (Bowler)
Canberra College of Advanced Education (Ollier, McLean, Thom, Wace, Walker)
Climatic Change Conference, Norwich (Bowler)
Department of the Capital Territory Conservation Conference (Wace)
Ecological Society of Australia (Walker)
Institute of Australian Geographers Annual Conference (Jennings, Thom)
Institute of Botany, Academia Sinica, Peking (Walker)
Institute of Geochemistry, Academia Sinica, Kweiyang (Bowler, Jennings, Walker)
Institute of Geography, Academia Sinica, Peking (Jennings)
Institute of Vertebrate Palaeontology and Palaeoanthropology, Academia Sinica, Peking (Bowler)
James Cook University (Barry)
Laboratory of Tree Ring Research, University of Arizona, Tucson (Ogden)
Macquarie University, School of Earth Sciences (Jennings, McLean)
Monash University (Ollier)
Numerical Meteorological Research Centre, Melbourne (Barry)
Pacific Science Congress, Vancouver (Singh: read in his absence)
Papua New Guinea Botanical Society (Ash)
Reef Biogenesis Symposium, Australian Institute of Marine Science, Townsville (McLean)
Riverina College of Advanced Education (Dare-Edwards)
Royal Botanic Garden Herbarium, Sydney (Nelson)
Royal Meteorological Society, Australian Branch (Walker)
Royal Military College, Department of Geography, Duntroon (McLean)
Second Coastal and Ocean Engineering Conference (McLean, Thom)
Symposium on the Coastal Zone, Water Research Foundation (Thom)
University of East Anglia, School of Environmental Studies (Bowler)
University of Melbourne (Barry)
University of New England (Barry)
University of Newcastle (Barry)
University of New South Wales (Barry)
University of Papua New Guinea (Barry)
University of Queensland, St Lucia (Barry)
Victorian Institute of Mining and Metallurgy (Ollier)
Victorian Quaternary Group (Ollier)

Several members of the Department also attended, and sometimes officiated at, other meetings (e.g. ANZAAS, British Ecological Society) whilst Professor Walker and Drs Bowler and Jennings were amongst a party of six Quaternary research workers to visit China as guests of Academia Sinica.

Members of the Department's staff continue to hold office in a

variety of national and international organizations. They have also been called upon to give formal advice on environmental issues to seven enquiries sponsored by governments, societies or companies.

Professor Walker returned from study leave on 18.4.75 and Dr Bowler, who had acted as Head of Department in his stead, left for study leave in Cambridge, UK on 15.6.75.

Acknowledgements

It is appropriate to make special mention of the Department's indebtedness during the years of its work in Papua New Guinea to Mr J. S. Womersley who retired from his position as Assistant Director (Botany) of the Department of Forests, PNG, in December. His maintained interest in our work forged a link between the Department and the Division of Botany which we anticipate will continue to strengthen in the future.

Dr R. Brewer, Division of Soils, CSIRO, has served as joint supervisor for Mr Dare-Edwards' research topic; and Dr Nancy Burbidge, Division of Plant Industry, CSIRO, as joint supervisor on Mr Nelson's Ph.D. work.

During the year, members of the Department have been fortunate to receive assistance from the following individuals and institutions:

Mr T. Carew, Edward River Mission.
Dr J. Chappell, Geography Department, ANU.
Mr L. Delroy, Department of Environment and Conservation, SA.
Mr K. Doyle, Forestry Department of NSW, Mitiamo.
Dr HJ Eichler and staff of Herbarium Australiense, CSIRO.
Dr C. W. Ferguson, University of Arizona, Tucson, USA.
Mr J. Kendall, Edward River Mission.
Mr J. Marshall, Research School of Earth Sciences, ANU.
Mr D. Munro, History Department, Macquarie University, NSW.
Mr K. Price, Mulooroo, SA.
Mr T. Roseby, Manaroo, NSW.
Dr P. Roy, Geological Survey of NSW.
Mr M. Shean, Moolwatana, SA.
Dr P. van Royen, Bishop Museum, Honolulu.
Dr W. Wassermann, Canberra College of Advanced Education.
Mr M. Winfield, Telefomin, PNG.
Dr L. D. Wright, Department of Geography, Sydney University.
Australian National Antarctic Research Expedition, Melbourne.
Division of Land Use Research, CSIRO.
Director and Mt Field staff of National Parks and Wildlife Service of Tasmania.
National Herbarium, Department of Forests, Lae, PNG.
New South Wales Parks and Wildlife Service.
Research School of Biological Sciences, ANU.
State Herbarium of South Australia.

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* former member of the Department; based on work done here

† not a member of this University

¹ based on work done before joining this Department

² member of the Department of Geography

³ member of the Department of Prehistory

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² member of the Department of Geography

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