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THE AUSTRALIAN NATIONAL UNIVERSITY
RESEARCH SCHOOL OF PACIFIC STUDIES
DEPARTMENT OF BIOGEOGRAPHY AND GEOMORPHOLOGY

ANNUAL REPORT 1969

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. (Cantab.)
Senior Fellow	D. N. McVean, B.Sc. (Glas.), Ph.D. (Cantab.)
Honorary Fellow	W. H. Litchfield, B.Sc. Agr. (Syd.)
Research Fellows	J. M. Bowler, B.Sc., M.Sc. (Melb.) Helena E. Swierczkowska-Reeve, B.Sc., Ph.D.. (Leicester) P. W. Williams, B.A. (Dunedin), Ph.D. (Cantab.) [to 30.4.69]
Research Assistants	Miryam Glikson, M.Sc. (Jerusalem)* Joan C. Guppy, B.Sc. (Adelaide) * R.J. Johns, M.Sc. (Auckland) [to 7.8.69] A.P. Kershaw, B.Sc. (U.C. Wales), M.Sc., (Dunelm) Honor Moore, B.Sc., M.Sc. (Melb.)* (Syd.)
Honorary Research Assistant	Jeannette Hope, B.Sc., Ph.D. (Monash) [14.4.69-28.11.69]
Technical Officers	K. Fitchett R.A. McDonell Judith A. Williams * [to 20.3.69]
Laboratory Technicians	Ilse Dawson * [to 17.1.69] Karen Evans * [to 27.2.69] Patrice Goncz * [from 10.2.69] D. James Dianne Lockie * [from 21.4.69] Rosemary B. McKenna* [from 24.3.69] Patricia Mudge * Margaret Ramsay * Eileen Tricket * [to 30.4.69] Jean Low [from 19.11.69]
Laboratory Attendant	Constance J. Thompson [from 22.9.69]
Departmental Secretary	Elizabeth A. Malin
Typist	Doris E. Corson

* Part-time appointments.

Research Scholars

R.J. Coventry, B.Sc.(Hons I)(ANU)
 R.M. Frank, M.A.(Geology)(Texas)[to 29.8.69]
 R.J. Hnatiuk, B.Sc.(Hons I)(Alberta)[fr.13.10.69]
 G.S. Hope, B.Sc.(Hons I), M.Sc.,(Melb.)
 I. Noy-Meir, B.Sc.,M.Sc. (Jerusalem)
 J.I. Raine, B.Sc.(Hons I)(ANU) [from 2.6.69]
 J.M. Wheeler (Mrs J.Powell) B.Sc., M.Sc.(Hons I)
 (Auckland)
 M.A.J. Williams, B.A.(HonsIII)(Cantab.)
 Ph.D. (ANU) [to 25.3.69]
 J.M. Urquhart, M.A.,(Toronto)[from 27.10.69]

Visitors

Mr J.A. Peterson, Lecturer in the Geography Department of Monash University, held the appointment of Visiting Research Fellow from 26.5.69 to 20.8.69. In addition, the Department benefited from visits of a few days and longer from the following:

Professor A.R. Clapham,	Sheffield University, U.K.
Dr T.D. Ford,	Leicester University, U.K.
Dr D. Greenland,	Canterbury University, N.Z.
Professor A. Jopling,	Toronto University, Canada.
Professor D.B. Lawrence,	University of Minnesota, U.S.A.
Mr P. Milne,	I Psychology Research Unit, Albert Park Barracks Victoria.
Mr C.D. Ollier,	University of Papua and New Guinea.
Professor R.F. Peel,	Bristol University, U.K.
Dr A. Richards,	University of New South Wales.
Dr Jane Soons,	Canterbury University, N.Z.
Dr P. Tilley,	Sydney University, N.S.W.
Dr N.M. Wace,	Adelaide University, S.A.
Dr P. Wardle,	D.S.I.R., Christchurch, N.Z.
Dr L.J. Webb,	CSIRO, Brisbane, Qld.
Mr W.J.E. Webster,	University of New England, N.S.W.
Mr J.S. Womersley,	Department of Forests, T.P.N.G.

Three members of the Alpha Helix Expedition, including Professor Sharman (NSW) and Dr J. Buck, Professor A.R. Clapham(Sheffield), Professor J.L. Gressitt (B.P. Bishop Museum, Honolulu), Dr Jolivet and a Garoka Teachers' College party, a Madang Teachers College party, Mr J.A. Peterson (Monash) and Dr P. Wardle (D.S.I.R. Christchurch, N.Z.) availed themselves of the facilities at the Mt Wilhelm Field Station, T.P.N.G.

The Role of the Department

The Department of Biogeography and Geomorphology has inherited from the former Department of Geography an intrinsic concern with certain aspects of the physical and biological environment of man in Australasia, S.W. Pacific and S.E. Asia. Landforms and their vegetative cover comprise the aspects which will normally be investigated though occasional studies may be made into other facets of the natural environment, e.g. climate, where special circumstances suggest or require.

On the biogeographical side, the sociology and ecology of plant communities, including quantitative and productivity approaches, comprise a major field, so far centred on mountain communities and the Australian mallee. Studies of secondary or anthropogenic plant successions provide links with the Human Geography and Anthropology Departments. Less central interests lie in the geographical distribution of plant taxa in our area, especially of lichens and mosses, and in lifeforms, e.g. pachycauly and Proteaceous leaf shape. Greatest effort has so far gone into vegetation history through palynology. This branch of Quaternary research has so far forged the closest links with Departmental landform studies and has led to close involvement also with the Prehistory Department.

Within geomorphology, emphasis is given to the historical evolution of landforms in which sedimentology of associated superficial deposits is regarded as the vital tool. This provides a valuable counterpart to the palynological work of the Department and also leads to strong association with Prehistory. Elaborations of morphometric methods and enquiries into present day processes fashioning the landscape are also pursued and it is expected that these will, in due course, provide working ties with the Department's investigations of modern vegetation. Of landform categories, coasts, karst and lakes have received most attention but fluvial and slope researches are also carried on.

Though the main objectives thus outlined are avowedly of the nature of 'pure science', some of the researches have an applied value and there is an active concern with conservation in its widest sense. Opportunities for participation in practical problems of wise use of environment and natural resources are taken up to a degree consistent with the prime role of the Department.

Personalia

Professor Walker was Acting Director of the Research School of Pacific Studies from 8th September to 17th October, 1969. Mr Jennings was Acting Head of the Department from 23rd October to the end of the year.

Dr P.W. Williams completed his short-term Research Fellowship and returned to his post in Trinity College, Dublin; a new appointee to the post he vacated failed to meet the conditions attached to his appointment and the post has been re-advertised. Dr Gurdip Singh of the Birbal Sahni Institute of Palaeobotany,

Lucknow, was appointed to a Fellowship in the field of palynology and will arrive in Canberra during 1970. Mr Johns, appointed to maintain field work on Mt Wilhelm in 1968, was withdrawn from the mountain during the year for health reasons and later resigned to take up an appointment as ecologist in the Department of Forests, T.P.N.G. The Department's policy of employing married women on a part-time basis as Laboratory Technicians continues to bring with it a relatively high rate of resignation and replacement; on balance, however, the advantages of the policy outweigh the disadvantages.

Three research scholars left the Department during the year, one with his thesis not quite completed; another effectively left but will return for a few weeks in 1970 to see her thesis through the last stages of preparation. Of these three, two were appointed to lectureships - at Macquarie University and the University of West Indies; and the third married and travelled in North America and Britain. Three new research students arrived in the Department, two from Canada and one from Canberra.

In July Mr Litchfield began a year's visit to Europe during which he will work, for much of the time, in the C.N.R.S. palynology laboratory at the University of Montpellier. Dr McVean took short study leave in the latter part of the year during which he visited centres in Britain, New Zealand and South Africa. Mr Bowler made a rapid round-the-world journey visiting radiocarbon dating and geomorphological research centres in Japan, Sweden, France and U.S.A. Professor Walker left for three months study leave in New Zealand on 23rd October, centred on the Botany Department, University of Otago, Dunedin.

Research

At least half of the Department's research effort during the year has been in aspects of Quaternary research and whilst it is not the Department's policy to allow these to dominate its work it is clear that their present preponderance will persist for some years to come. In Australia, Mr Bowler has brought his work on the Quaternary stratigraphy of the Riverina Plain and Mallee lakes to near completion and this, together with his investigations of water level changes in Lake Keilambete, Victoria, is allowing a climatic reconstruction of the Late Quaternary hardly paralleled for detail and consistency elsewhere in Australia. The use of radiocarbon dating, an essential chronological tool, in this context has itself presented problems the solution of which by Mr Bowler in close collaboration with the University's radiocarbon dating laboratory and the Riken radiocarbon laboratory, Tokyo, has made a substantial contribution to the development of the technique. Deposits with which Mr Bowler was concerned geomorphologically have yielded human artifacts and a human skeleton which, from the stratigraphic context and Mr Bowler's earlier radiocarbon dating, may well prove to be as much as 32,000 years old. These discoveries are now being followed up by the Research School's Department of Prehistory.

Close to Canberra, Mr Frank completed his field and laboratory work on geomorphology and sediments of several cave systems in the western Central Tablelands of New South Wales, including the famous Wellington Caves. Interpretation is not yet finished but results of general as well as intrinsic interest are emerging in regard to gash-breccias and various cave solution-forms. On the other hand it has not proved possible to derive much surface paleoenvironmental evidence from the cave sediments.

Mr Coventry has carried out a prodigious amount of augering, pit-digging, and core-collecting in the beach ridges and other sediments around the northern end of Lake George, amassing evidence of a history of lake-level fluctuation, and probably therefore of climatic change, much more complex than was hitherto imagined.

The Late Quaternary vegetation history of the New Guinea Highlands has progressed considerably during the year, particularly as a result of the light shed by Miss Wheeler's work on the impact of human activity on the vegetation of the Mt Hagen area. Mr Hope has completed his first period of field work on Mt Wilhelm where he has located and sampled deposits which promise to yield a record of tree-line and other vegetation changes since the last glaciation there. The effects of the glaciation on the massif itself and an attempt at the chronology of deglaciation were the subjects of Mr Peterson's field work whilst he was a Visiting Research Fellow of the Department.

Mr Kershaw's work on the vegetation history of the Atherton Tableland, North Queensland, has revealed that the rain-forest there is not as stable as is usually supposed. In what must rank as a major contribution to Australian vegetation history, probably indeed the most important made to date, Mr Kershaw has shown that the Lake Euramoo area, now rain-forested, was sclerophyll and Casuarina dominated from 10,000 to 7,500 years ago and that, since its inception there, the rain forest has undergone considerable changes in composition which can only reasonably be interpreted as the effects of climatic change. The generality of these changes over a wider area of the Atherton Tableland is currently being investigated.

The technique of palynology still leaves much to be desired. In particular it is important to know more about the degree to which the pollen reaching an accumulating deposit reflects the surrounding vegetation. This kind of enquiry is central to the work of Mr Hope in New Guinea and Mr Raine on Mt Kosciusko, N.S.W. The latter is setting up a sampling arrangement to determine whether the pollen reaching the surface of a lake is differentially redistributed before it is accumulated in the sediments with a view to using this information to control the interpretation of fossil pollen spectra. The computer-assisted storage and retrieval of pollen morphological data is proving its worth already by facilitating the more rapid identification of fossil grains; 1500 pollen preparations have now been described, a rate reflecting very much

to the credit of those involved but highlighting the urgent need of more labour for this task. Professor Walker, in collaboration with Dr M.B.Dale of CSIRO, has begun an examination of the use of numerical methods, computer operated, in the analysis of pollen analytical results which promises to throw a lot of light on the operations of the analyst's mind even if it does little to enhance the speed or validity of the interpretation itself.

Departmental research not directly related to the Quaternary Period has also progressed steadily through the year. Mr Jennings has continued his observations on the hydrology of the Cooleman Plain karst, where automatic recording instruments are now being employed, and has made further surveys of caves in that area. He has continued his work on stone movement by snow creep on Mt Kosciusko and initiated observations on tombolo formation and degradation at Broulee on the coast of N.S.W.

Ecological and meteorological work on Mt Wilhelm, T.P.N.G., has not developed as rapidly as was hoped because of the difficulty of keeping the station there suitably manned. However, Dr McVean has been able to make some progress with the analysis of the fragmentary meteorological data whilst his own and Dr Wade's work on the plant sociology of the alpine and subalpine vegetation of the mountain has culminated in the first volume of the new Departmental Publications series. Advantage was taken of the experience of Mr Hope's wife in animal ecology to initiate a study by her of the distribution of mammals in relation to vegetation and altitude on Mt Wilhelm. Mr Noy-Meir virtually completed the collection of a very large amount of data for his study of ordination methods in vegetation analysis, began its analysis and completed his theoretical considerations of measures of similarity. Outside the immediate field of his Ph.D. topic, Mr Noy-Meir has carried out studies of models of vegetation-gradient ordination (with Dr M.P. Austin, CSIRO) and of multiple pattern analysis (with Dr D.J.Anderson, R.S.Biol.S.) which will shortly be published.

Dr Helena Swierczkowska-Reeve has continued her studies of trunk development, and frond economy in Cyathea species and Macrozamia in relation to the pachycaul habit and of leaf shape variety and its development in the Proteaceae.

Professor Walker, whilst on study leave, has returned to the analysis of New Guinea swamp vegetation data collected in 1962.

Seminars

In addition to informal seminars of the work-in-progress kind and talks from visiting scientists, the Department now sponsors a Quaternary Discussion Group to which all those in Canberra with an interest in the Quaternary Period are invited. It is a measure of this interest that the first meeting of the group in August, addressed by Mr Bowler, attracted 34 participants.

Conferences and outside activities

Professor Walker has wound up the Palynology Sub-committee of the Pacific Science Association of which he was chairman, its useful functions having now been taken over by the International Palynological Committee of which he is Australian member; he remains a member of the Association's Standing Committee on Botany. Professor Walker continues as convener-chairman of the I.B.P. Working Group on Air Spora which held a successful two-day inter-disciplinary meeting in August to which he also contributed a paper. The Australian Academy of Science has appointed him a member of its newly-formed National Committee for Quaternary Research. He chaired a session of the Symposium on Continental Drift at the Adelaide ANZAAS Conference. During the year he provided a course in palynology (about 30 contact hours) for two Honours students of the Department of Geology, S.G.S., and conducted a palynological research exercise with six children and one teacher from Canberra schools (26 contact hours). He also lectured at a weekend course organized by Australian Frontier on "The Challenge of Rapid Social Change".

Mr Jennings also contributed to school level education by a further year of "working" patronage of the A.C.T. Geography and Economics Teachers' Association and by writing a children's book on caves.

During part of his study leave, Dr McVean acted as a consultant in land use ecology to Hunting Technical Services' water management study in Lesotho, southern Africa.

Mr Litchfield and Mr Bowler attended the INQUA Congress in Paris during August; the latter read a paper there embodying the results of some of his recent work in Australia. Mr Bowler was also present, as an observer, at the 12th Nobel Conference on Radiocarbon in Uppsala and was joint author of a paper presented by Mr H. Polash (Radiocarbon Dating Laboratory) to the Adelaide ANZAAS Congress. He also delivered 5 lectures and a seminar by invitation in the Department of Geology, Melbourne University.

Dr McVean, Mr Raine and Mr Noy-Meir attended the ANZAAS Congress in Adelaide. There the latter read a paper on 'Component analysis of subarid vegetation'; he was also joint author of a paper on multiple pattern analysis read by Dr D.J. Anderson (R.S.Biol.S.) to a symposium on statistical ecology at New Haven, U.S.A. Mr Jennings, Mr Coventry and Mr Raine attended the 2nd meeting of the Specialist Group in Sedimentology of the Geological Society of Australia at Sydney in November. Mr Hope gave a paper to the triennial conference of the Limnological Society of Australasia on his M.Sc. research at Melbourne University; this thesis earned him an award for the best M.Sc. thesis of 1968 from that University. Mr Coventry has led several excursions to the Lake George area, notably one for the Department of Geology (S.G.S.) and another for the Department of Adult Education. Whilst returning to North America, Mr Frank attended the 5th International Speleological Congress at Stuttgart, where Dr P.W. Williams reported on some of his New Guinea karst morphometric results.

Doctorates awarded or recommended:

- Wade, L.K. The alpine and sub-alpine vegetation of Mt Wilhelm, New Guinea.
- Williams, M.A.J. Rates of slope wash and soil creep in northern and southeastern Australia.

Publications

Two more volumes in the ANU Press series - "An Introduction to Geomorphology" of which Mr Jennings is editor, have appeared during the year, as has "Studies in the Vegetational History of the British Isles" from the Cambridge University Press of which Professor Walker is joint editor. The following have also been published:

- Bowler, J.M. 1969 The Keilor terraces: an assessment of geological problems. The Artefact 14, 1-6.
- Flenley, J.R.*1969 The vegetation of the Wabag region, New Guinea Highlands: a numerical study. J. Ecol. 57, 465-490.
- Frank, R.M. 1969 The clastic sediments of Douglas Cave, Stuart Town, N.S.W. Helictite 7, 3-13.
- Holland, P.G.* 1969 The plant patterns of different seasons in two stands of mallee vegetation. J. Ecol. 57, 323-333.
- 1969 Weight dynamics of Eucalyptus in the mallee vegetation of southeast Australia. Ecology, 50, 212-219.
- Jennings, J.N. 1968 Underground geography. New Zealand Geogr. Soc. Rec. 45, 1-4.
- 1968 The Nullarbor Plain, Australia; a dryland karst region. New Zealand Geogr. Soc. Rec. 45, 14-19.
- 1968 Tafoni in Fairbridge, R.W. (ed.) P. 1103-1104 in Encyclopaedia of Geomorphology, Reinhold, New York.
- 1969 Periglacial blockstream. Australian Landform Example No.13. Australian Geographer 11, 85-86.
- 1969 Karst of the seasonally humid tropics in Australia. p. 149-158 in Problems of the Karst Denudation Brno 1969 ed. O. Stelcl. Studia geographica 5. Institute of Geography, Brno.
- Jennings, J.N., Nankivell, T.⁺, Pratt, C.⁺, Curtis, R.⁺, and Mendum, J.⁺ 1969 Drought and Murray Cave, Cooleman Plain, New South Wales. Helictite, 7, 23-28.
- Kellman, M.C.* 1969 Some environmental components of shifting cultivation in upland Mindanao. Journ. Trop. Geogr. 28, 40-56.
- Litchfield, W.H.** 1969 Soil surfaces and sedimentary history near the MacDonnell Ranges, N.T. CSIRO Soil Pub. No. 25, 45 pp.
- Mabbutt, J.A.⁺, Wooding, R.A.⁺, and Jennings, J.N. 1969 The asymmetry of Australian desert sandridges. Aust. J. Sci. 32, 159-160.
- McVean, D.N. 1969 Alpine vegetation of the central Snowy Mountains of New South Wales. J. Ecol. 57, 67-86.
- McVean, D.N., and Lockie, J.D.⁺ 1969 Ecology and Land Use in Upland Scotland. 134 pp. Edinburgh University Press, Edinburgh.
- McVean, D.N.** and Robertson, V.C.⁺ 1969 An ecological survey of land use and soil erosion in the West Pakistan and Azad Kashmir catchment of the River Jhelum. J. Appl. Ecol. 6, 77-109.
- Noy-Meir, I.** and Ginzburg, B.Z.⁺ 1969 An analysis of the water potential isotherm in plant tissue. II. Comparative studies on leaves of different types. Aust. J. Bot. 22, 35-52.

- Wade, L.K.*, and McVean, D.N. 1969 Mt Wilhelm Studies I. The Alpine and Sub-alpine Vegetation. Department of Biogeography & Geomorphology Publications BG/1, XVI + 225 pp., The Australian National University, Canberra.
- Walker, D. 1969 Direction and rate in some British post-glacial hydroseres. In Walker, D., and West, R.G. (eds.) p. 44-54 in Studies in the vegetational history of the British Isles, Cambridge University Press.
- Walker, D., Milne, P.,† Guppy, Joan and Williams, Judith.* 1968. The computer assisted storage and retrieval of pollen morphological data. Pollen et Spores 10, 251-262.
- Williams, M.A.J.* 1969 Prediction of rainsplash erosion in the seasonally wet tropics. Nature, 222, 763-4.
- Williams, P.W.* 1969 The geomorphic effects of ground water. Ch. 6.II, p. 269-284, in Water, Earth and Man. Ed. R.J.Chorley, Methuen, London.

* Formerly a member of the Department, or of the former Department of Geography, and based on work done there.

† Not a member of the University.

** Based on work done prior to joining this University.

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Mr J. Calaby,	CSIRO, Canberra.
Dr M.B. Dale,	CSIRO, Canberra.
Dr C. Hendy,	Institute of Nuclear Research N.Z.
Dr R.D. Hoogland,	ANU, Canberra.
Mr B. Hyland,	Department of Forests, Atherton, Qld.
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Dr C. Ollier,	College of Advanced Education, Canberra.
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ANU, Departments of Botany and Geology, SGS, Canberra.
 Canberra Speleological Society.
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 " Division of Plant Industry (Soil analysis laboratory) Canberra.
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