

SCHOOL OF SURVEYING

REPORT

1974 - 1975

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1. GENERAL

This report covers the period April 1974 - April 1975. For the University as a whole this has been a period of financial stringency, with the 1975 allocations of funds and new staff seriously affected. The School of Surveying, which had a considerable increase in first year numbers in 1973, has been hard pressed to cope with the effects of this increase as the larger class has progressed upwards, currently as far as third year. Due to this spectacular increase, which is documented in Section 3, special allocations of funds and teaching positions were made in 1975. These were not sufficient to deal with the full increase, but they enabled some progress to be made, in spite of the difficult times.

In general, enrolments in universities have shown a tendency to decrease in 1975, but again Surveying has not felt the full effect. There has been a strong demand for places in the B.Surv course, so that the lowest Higher School Certificate aggregates accepted for admission, have been considerably higher than for other schools in Engineering. One consequence has been a significantly higher pass rate for the 1974 first year class.

The increased commitments, following on the increases in student numbers, led to difficulties in shortage of staff, equipment, accommodation and running expenses. Staffing difficulties have eased. Accommodation shortages, especially staff offices, have been serious over the past months, but operations have commenced to relieve this pressure. By mid 1976, part of the School should be housed in a new wing of the Mechanical Engineering Building. The remaining serious difficulty is shortage of funds for equipment.

On a more optimistic note, an appointment to the second Chair, in the field of Photogrammetry has been finalized and the incumbent will take up duties in July. At this time it is proposed to divide the School into three Departments, the Department of Geodesy, under Professor Angus-Leppan, the Department of Photogrammetry under the new Professor, and Department of Surveying under Associate Professor Bennett. Professor Angus-Leppan will remain the Head of School.

Two important committees will be the School Executive, consisting of Heads and other representatives of Departments, and the larger School Committee comprising academic and tutorial staff, graduate students and representatives of undergraduate students.

Research activity in the School has increased in volume and scope (Section 4). In geodesy there is an active group, under Associate Professor R.S. Mather undertaking closely interrelated projects in satellite and four dimensional geodesy. A similar group is growing in Photogrammetry.

2. UNDERGRADUATE COURSE

The implementation of the Sandwich Course commenced in 1975, with Parts 1 and 3 offered in Session 1. The old Stage 3 (evening) course is not offered this year. The first year Mathematics and Physics subjects remain two-session courses. As a result Sandwich Course students can only take Part 1 in Session 1, then Part 2 in Session 2 of the following year, with a full year in between. To alleviate this difficulty, Stages 1 and 2 of the part-time (evening) course are still offered. The Sandwich Course will be phased in, Part by Part, until it is fully implemented by 1980.

Comments of students who undertook the five-month period of Professional Training in the first half of the final year in 1974 were generally favourable. Some of the 1975 class experienced difficulty in finding suitable employment, but it is believed that all have now found satisfactory positions.

Lecturing staff are adapting to larger classes, the effect of which is felt particularly in the senior years. Larger classes call for a modified teaching style, and more detailed organisation and preparation. With the current form of evaluation, by continuous assessment, a heavy marking load is involved.

3. ENROLMENTS

Total undergraduate enrolments have continued to maintain the upward trend, which began around 1971/72 and, although there was a slight decline in the number of Full-time 1st year enrolments in 1975, the peak intakes of 1973 and 1974 reflected themselves in the large 2nd and 3rd year classes. Demands on staff and equipment have consequently increased quite rapidly and placed considerable pressures on the resources available.

First year enrolments for the Part-time course declined markedly in 1975 as a consequence of the introduction of the Sandwich Course. Stage 2 of the Part-time course will be similarly affected in 1976 and the entire Part-time course phased out by 1980.

Undergraduate student numbers in 1975 represent an increase of 71% over 1970 and 45% over 1972. Details are shown in the Table below.

TABLE - ENROLMENTS DATA

<u>B.Surv. - Full-time</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>1974</u>	<u>1975 *</u>	<u>1976 *</u>
<u>Year</u>						
1	44	59	97	102	89	90
2	48	40	50	81	88	75
3	38	43	42	50	78	89
4	26	38	37	37	54	73
Total F/T.	156	180	226	270	309	327
<u>B.Surv. - Part-time</u>						
1	24	24	32	44	8	30
2	15	16	13	11	24	4
3	14	16	12	11	-	-
4	8	13	14	12	5	-
5	12	7	10	8	6	3
6	10	14	7	14	9	7
7	18	14	18	9	14	11
Total P/T.	101	104	106	115	66	55
<u>B.Surv - Sandwich</u>						
1				-	26	-
3				-	13	13
Total Sandwich					39	20
Total F/T, P/T, Sandwich	257	284	332	385	414	426
<u>Post Graduate</u>						
Ph.D	2	6	5	6	45	
M.Surv	5	4	3	3	76	
M.Surv.Sc.	8	7	7	8	56	
Total	15	17	15	17	167	17

* Provisional. As on 8.4.75

* Estimated

4. HIGHER DEGREES

The number of Post Graduate students in 1975 is 16 of whom eleven are undertaking research degrees.

A new feature of the post-graduate study in the School is the grouping together of staff and higher degree students to undertake a major programme of research, comprising a number of inter-related projects. This is most highly developed in geodesy but is also a feature of research in Photogrammetry. Of the eleven research students, eight are involved in research in geodesy and three in photogrammetry.

5. DEGREES AWARDED

The following degrees were awarded during the year :

Bachelor of Surveying:

Honours, Class I	3
Class II, Division 1	6
Class II, Division 2	8
Pass	<u>24</u>
	<u>41</u>

Doctor of Philosophy :

H.L. Mitchell

Thesis: "Relations between mean sea-level and Geodetic levelling in Australia".

G.J.F. Holden

Thesis: "An evaluation of Orthophotography in an integrated mapping system".

G.J. Hoar

Thesis: "The analysis, precision and optimization of Control Surveys".

Master of Surveying Science:

H.B. Tahir

R.C. Patterson

C.W. Jeremy

G. Halsey

6. PRIZES, AWARDS AND ELECTIONS

Professor P.V. Angus-Leppan has been appointed as Chairman of the Australian National Committee on Geodesy and Geophysics (ANCOGG) of the Academy of Science. Professor Angus-Leppan has been reappointed as Chairman of the Sub-Committee on Geodesy and Associate Professor R.S. Mather has been reappointed as a member of the Sub-Committee.

Associate Professor R.S. Mather was elected by the International Gravity Commission at Paris during September 1974 to a six-member Board of Directors; International Gravity Bureau for 1974-78. (IGB is a UNESCO sponsored data gathering agency).

Associate Professor G.G. Bennett was reelected to the Committee of the N.S.W. Division of the Institution of Surveyors, Australia for 1975. He was also elected as Vice-President. Professor P.V. Angus-Leppan was re-appointed to the Board of Surveyors N.S.W. for 1974 and 1975.

Grants were awarded by the Australian Research Grants Committee to the following members of staff of the School of Surveying:

Associate Professor R.S. Mather -

- a) \$45,628, for "Determination of Stationary Sea Surface Topography off north-eastern Australia using the GEOS-C spacecraft".
- b) \$13,936, for "Determination of Earth & Ocean Tide Interactions in Australia for the reduction of geodetic observations".
- c) With Professors R. Green and H.J. Harrington of University of New England, \$4,260 for "Gravimetric Determination of the Deformation of the Geoid in Indonesia and its Tectonic Implications".

Dr. J.C. Trinder -

A further grant of \$6,000 to continue his research into the geometry ERTS Multi Spectral Scanner Imagery.

Associate Professor R.S. Mather was elected a Fellow of the Institution of Surveyors, Australia.

Dr. J.S. Allman was invited to join the International Association of Geodesy Special Study Group No. 4:38 in "Computer Techniques in Geodesy".

Associate Professor R.S. Mather was invited to be a member of the International Association of Geodesy Special Study Group No. 5:39 in "Fundamental Geodetic Constants".

Associate Professor R.S. Mather received a travel grant to attend IAU Colloquium No. 26 at Torun, Poland to present an invited paper and act on the Editorial Committee for the Proceedings of the Colloquium (August - September 1974).

Associate Professor R.S. Mather has been appointed principal investigator for the Australian experiment on the GEOS-C satellite mission by National Aeronautics and Space Administration (NASA).

Professor Angus-Leppan was appointed as a member of the Panel to assess the Cartography Major in the Geography and Arts degrees at the Canberra College of Advanced Education.

7. DONATIONS, LOANS

Dr. J.S. Allman received a donation of \$200 from Hewlett Packard(Aust) Pty. Ltd. as assistance towards his expenses to attend a Symposium at the University of New Brunswick, Fredericton, Canada.

The Department of Lands donated to the School 14 single minute glass arc theodolites.

The following institutions assisted the School by making available e.d.m. equipment for use at the Bathurst Survey Camp free of charge:-

1. University of Newcastle
2. Sydney Technical College
3. Hewlett Packard (Aust) Pty. Ltd.
4. Wild (Aust) Pty. Ltd. and
5. A.G.A. Products Aust. Pty. Ltd.

8. EQUIPMENT

The following equipment was purchased by the School during the year under review:-

- 3 Wild Digitisers for A8 Stereoplotter
- 2 NI 2 Carl Zeiss automatic Levels
- 1 Wild A6 Autograph Photogrammetric Stereoplotter (second-hand)
- 4 Sharp 27 MHZ Band Two-way communicators
- 10 Stereoscopes Top Con Model 3 with Binoculars
- 15 Stop Watches Huer Model No. 513201 and
- 1 Canon Universal Microfilm Recorder

In addition, a number of minor items were received during the year from A.R.G.C. Grants.

The items listed below are also on order:-

- 1 H.P. Calculator with accessories
- 2 Cannon F7 Calculators
- 1 35 mm Reflex Camera and accessories
- 1 Cartographic Plotter CPI (Thompson)
- 1 SP 25 Dual Binocular System
- 1 1" Theodolite

9. RESEARCH AND PUBLICATIONS

(a) Research Activities

Research activities in the School of Surveying have continued in the fields of (in alphabetical order) geodesy, photogrammetry, positional astronomy, surveying and surveying education.

In geodesy, research activities have concentrated in the areas of four dimensional geodesy and its applications to geodynamics, optimization techniques and physical geodesy. In the former, the problems associated with the definition of systems of reference for use in geodynamics are being studied including those associated with the use of laser ranging data to retroreflectors on the moon and Very Long Baseline Interferometry (VLBI). Research also continues into the optimization of geodetic and local survey control networks. ARGC support was received for the development of techniques for the re-adjustment of the Australian Geodetic Network. Portions of the triangulation of Sumatra and other networks have been optimized under contract for the Royal Australian Survey Corps. An investigation of optimization parameters has been completed and studies continue in the use of optimization techniques to ensure the most economical use of observations to achieve a given precision. The effect of lunar ephemeris errors on the parameters in geodynamics determined from laser ranges to the moon is being studied.

An important new development in the field of physical geodesy is the acceptance by National Aeronautics & Space Administration (NASA) of a pilot project to study sea surface slopes as a Principal Investigation on the GEOS-C Mission, due for launch in 1975. This project is financially supported by ARGC. Preliminary theoretical developments for the determination of the sea surface from a level surface in this project have been completed. An interim compendium of Mean Sea Level and its departures from a level surface along coastlines has been compiled from global data. Investigations continue in determining deflections of the vertical from gravimetry using data collected in a disturbed region in northern New South Wales and on the quantitative determination of the effect of the Earth's topography on the shape of the geoid. Work has also commenced on the development of techniques to assemble gravity data banks of adequate quality for the study of sea level slopes.

A cooperative project has been initiated with the International Centre for Earth Tides (ICET) and the Bureau of Mineral Resources (BMR) to study the interaction of Earth and Ocean tides on the Australian continent. Data from the pilot station in the scheme at Port Moresby is currently being analysed. Experiments have been initiated to investigate the sources of systematic error of meteorological origin in precise levelling. Work is continuing in cooperation with the Geodynamics Branch of NASA's Goddard Space Flight Center (GSFC) on the use of gravimetric methods to establish a world Geodetic System. Cooperative arrangements with NASA are progressing toward the development of a satellite orbit analysis capability built around GSFC's GEODYN Program.

Research in photogrammetry has been supported by ARGC in the field of rectification of Earth Resources Technology Satellite (ERTS) Multispectral Scanner Imagery and its geometrical qualities for 1:250,000 mapping. Computer programs are being developed for block adjustment and digital terrain models are being applied to the mapping of contours. A report on the accuracy of contouring from digital terrain models has recently been prepared. A project on independent model triangulation with an assessment of the

influence of the accuracy of perspective centre calibration is nearing completion. Another area of research is the study of the impact of modulation transfer functions in the assessment of photograph image quality and hence suitable ground target sizes. The suitability of the CPl plotter for 1:10,000 mapping is being investigated and an environmental map of Broken Bay has been reproduced at this scale.

In field astronomy research is being undertaken into computer programmes for astronomical observation reduction which incorporate the generation of sun and star co-ordinates. These programmes are designed for the use of the surveyor who has a small programmable calculator capability. Investigations are also being made on a new instrumental attachment for the precise determination of azimuth. The initial results of the first trial observations have been successful.

Work continues with support from ARGC, on the development of a time base theodolite using laser and precise time measurements.

9. (b) School Publications

UNISURV Publications were first issued six years ago. In this period they have built up an international reputation. The Reports are issued as the S(Special) Series comprising special reports and theses, and the G Series. Arrangements have been made to convert the UNISURV G(General) Series into a regular journal, under the sub-title: An Australian Journal of Geodesy, Photogrammetry and Surveying. An editorial board, representative of the topics, from all parts of Australia, has been established. UNISURV G does not detract from the Australian Surveyor as nearly all the papers are highly technical and mathematical.

The School also publishes a Monograph Series, comprising texts specially prepared for teaching purposes. These are used mainly by students of the School but they are available to others.

A list of UNISURV publications for 1974 and 1975 is given below. Since the earlier publications have not been listed in the Visiting Committee Reports, a list up to 1974 is given in the Appendix.

UNISURV Report S.10	Study of Zero Error and Ground Swing of the Model MRA101 Tellurometer - A.J. Robinson
UNISURV Report S.11	Proceedings of the Symposium on Earth's Gravitational Field and Secular Variations in Position - R.S. Mather & P.V. Angus-Leppan (editors)
UNISURV Report S.12	An Evaluation of Orthophotography in an Integrated Mapping System - G.J.F. Holden
UNISURV Report S.13	The Analysis Precision and Optimization of Control Surveys - G.J. Hoar
UNISURV Report G.20	Papers on Network Adjustments, Photogrammetry and 4-Dimensional Geodesy - J.S. Allman, R.D. Lister, J.C. Trinder & R.S. Mather
UNISURV Report G.21	Paper on Refraction, Mathematical Geodesy and Coastal Geodesy - P.V. Angus-Leppan, E. Grafarend and R.S. Mather
MONOGRAPH No. 3	Tables for Prediction of Daylight Stars - G.G. Bennett
MONOGRAPH No. 4	Star Prediction Table for the fixing of Position - G.G. Bennett, J.G. Freislich and M. Maughan
MONOGRAPH No. 5	Survey Computations - M. Maughan

10. STAFF

(a) General

Selections were finalised for the new Chair in Photogrammetry and the position of Senior Lecturer in Land Studies, which were created during the previous year. The new Professor is expected to assume duties by about July 1975 and the Senior Lecturer in October 1975.

Mr. A.P.H. Werner was promoted as Senior Lecturer in August 1974.

4 new lecturers were appointed during the year under review. They were Mr. P.S. Amin (May 1974) Mr. S. Ganeshan and Mr. K.I. Groenhout (February 1975) and Dr. G.J. Hoar (March 1975). Mr. R.C. Patterson was appointed as Senior Tutor (April 1975).

Mr. M. Maughan, Senior Tutor, retired at the end of 1974.

Dr. A.J. Robinson and Dr. G.J.F. Holden, who left on Study Leave in December 1973, resumed duties in January 1975. Dr. J.S. Allman and Dr. A. Stolz are due to proceed on study leave by the middle of the year.

The staff of the School, presently, is as follows:-

Professor	1
Associate Professors	2
Senior Lecturers	4
Lecturers	10
Senior Tutors	2
Teaching Fellow	1

Due later in the year -

Professor	1
Senior Lecturer	1
Lecturer	1

Non Academic Staff

Special Projects Officer	1
Professional Officers	3 (one from Special Funds)
Technical & Laboratory Staff	7 (one position vacant)
Administration & Office Staff	5 (one position vacant)

10. (b) Visits by Staff

Professor P.V. Angus-Leppan met the Chairman of the Public Service Board of N.S.W. for discussions on the numbers of B.Surv Graduates in relation to a possible future shortage of surveyors in the profession.

P.V. Angus-Leppan attended the meeting of the V.I.C. Course Development Committee in Surveying, Melbourne in May and was called in for further consultation on the Postgraduate Diploma in Photogrammetry at Royal Melbourne Institute of Technology.

P.V. Angus-Leppan and Dr. F.K. Brunner visited the Bureau of Meteorology N.S.W. to discuss possible future work of both institutions.

Associate Professor Mather visited the following overseas institutions during the period May/June 1974:-

Department of Aerospace Engineering, University of Texas at Austin, Austin, Texas, U.S.A.
 NASA/Goddard Space Flight Center, Greenbelt Md, U.S.A. 14-17 and 28-31 May
 Department of Surveying Engineering, University of New Brunswick, Fredericton, Canada
 Batelle Laboratories, Columbus, Ohio, U.S.A.
 Jet Propulsion Laboratory, California Institute of Technology, Pasadena, California U.S.A.

Dr. A. Stolz visited the Division of National Mapping, Orroral Valley Lunar Laser Ranging Station for discussions on various research projects.

Professor Angus-Leppan and Associate Professor Mather visited the Australian Academy of Science in July for meeting of Geodesy Sub-Committee, Australian National Committee of Geodesy and Geophysics.

During a 3-week trip to Europe Professor Angus-Leppan visited the following:

Department of Photogrammetry & Surveying, University College, London
 Department of Civil Engineering, University of Nottingham
 Institute of Photogrammetry, Technical University Hanover
 Institutes of Geodesy & Photogrammetry, Royal Technical University, Stockholm
 Institute of Geodesy, Uppsala University
 Institutes of Geodesy & Photogrammetry, Federal Technical University, Zurich

Professor P.V. Angus-Leppan attended the IAG Symposium on E.D.M. & Geodetic Refraction in Stockholm and the IAG/CRCM Symposium on Recent Crustal Movements in Zurich. He also interviewed prospective staff members in London, Nottingham, Stockholm, Zurich and Vienna.

During a 4-weeks overseas trip Associate Professor Mather visited the following institutions:

Bureau International des Poids et Measures, Sevres France.
 International Gravity Bureau, Paris.
 Astronomical Observatory, Copernicus Univ., Torun, Poland.
 Technical University (Dept. of Geodesy), Warsaw.
 Technical University, Darmstadt, Germany.
 Institute für Angewandte Geodäsie, Frankfurt.

Dr. J.C. Trinder visited the Division of National Mapping in Melbourne for discussions on the use of ERTS Imagery.

Dr. J.C. Trinder, as Convenor of the Committee, presented the Report on "Needs of the Profession" to the Conference of the Reciprocating Surveyors' Boards in Melbourne.

Dr. S.U. Nasca attended the 1st Australian Cartographic Conference held at Sydney.

Professor P.V. Angus-Leppan attended the Conference of the Reciprocating Survey Boards of Australia and New Zealand in Melbourne as a representative of the New South Wales Board. As Chairman of the Education Panel, he presented the Report of the Panel.

Professor P.V. Angus-Leppan visited the Public Transport Commission and joined senior surveyors in a technical tour of the Eastern Suburbs Railway.

10. (c) Publications

- J.S. ALLMAN "The Condition Method in the Adjustment of Large Networks", *International Symposium on Problems related to the Redefinition of North American Geodetic Networks*, U.N.B. Canada, May 1974.
- J.S. ALLMAN & Z.S. KOLENDA "Coordination of Energy Balances in Heat Transfer" *Bulletin de l'Academie Polonaise des Sciences*, Vol. XXII, (6), 1974, pp. 33-(515) - 37-(519).
- J.S. ALLMAN & R.D. LISTER "Optimum number of arcs for ten-leg Traverses" *Unisurv G20*, Univ. of N.S.W., 1974, pp. 1-32
- P.V. ANGUS-LEPPAN "Refraction over snow and Ice Surfaces". *Paper presented at International Symposium on Terrestrial Electromagnetic Distance Measurements and Atmospheric Effects on Angular Measurements*, Stockholm, 1974, pp. 1-21. Also *Unisurv G21*, School of Surveying, 1974, pp.73-97.
- P.V. ANGUS-LEPPAN "Surveying Education in Australia," *Proc. of Fifth Conference of Southern African Surveyors*, Salisbury, Vol. 1, 1974.
- G.G. BENNETT "Sun Observations for Azimuth", *Aust. Surveyor*, No. 1, Vol. 26, 1974, pp. 62-81.
- G.G. BENNETT "Tables for the Prediction of Daylight Stars", *Monograph No. 3*, School of Surveying, Univ. of N.S.W., 1974, pp. 1-45.
- G.G. BENNETT, J.G. FREISLICH & M. MAUGHAN "Star Prediction Tables for the Fixing of Stars", *Monograph No. 4*, School of Surveying, Univ. of N.S.W., 1974, pp. xiii + 177.
- L. BERLIN & G.J.F. HOLDEN "Perspective Centre Calibration and Restoration Stability", *South African Survey Journal*, 1974, pp. 48-59.
- F.K. BRUNNER "Lotabweichungseinfluss bei der trigonometrischen Höhenmessung mit steilen Visuren. *Osterreichische Zeitschrift für Vermessungswesen und Photogrammetrie*, 61 (1973), pp. 126-134.
- F.K. BRUNNER & A.E. SCHEIDEGGER "Kinematics of a Scree Slope", *Revista Italiana di Geofisica*, Vol. xxiii, 1974, pp. 89-94
- F.K. BRUNNER E. BRUCKLE, E. GERBER & A.E. SCHEIDEGGER "Morphometrie einer Schutthalde. *Mitteilungen der Osterreichischen Geographischen Gesellschaft*, Bd. 116, 1974, pp. 70-96.
- F.K. BRUNNER "Trigonometrisches Nivellement. - Geometrisches Nivellement." *Osterreichische Zeitschrift für Vermessungswesen*, 62, 1974, pp. 49-60.
- F.K. BRUNNER "Trigonometric Levelling with Measured Slope Distance", *Proc. 18th Survey Congress Perth*, 1975, pp. 79-94.
- G.J.F. HOLDEN & L. BERLIN "Independent Models and Calculators", *Photogrammetric Engineering*, 1974, pp. 573-576.
- G.J.F. HOLDEN & L. BERLIN AIM-Independent Model Aerial Triangulation Desk Calculator Package. *Aust. Surveyor*, Vol. 26, No. 4, 1974, pp. 283-292.
- G.J.F. HOLDEN "An Evaluation of Orthophotography in an Integrated Mapping System", *Unisurv S12*, School of Surveying, Univ. of N.S.W., 1974, pp. 1-226.
- A.H.W. KEARSLEY "Semigraphic Solutions for Mixed Observations", *Aust. Surveyor*, Vol. 26, No. 3, 1974, pp. 162-171.
- R.S. MATHER & P.V. ANGUS-LEPPAN (Editors) *Proceedings of Symposium on Earth's Gravitational Field and Secular Variations in Position*, *School of Surveying*, Univ. of N.S.W., 1974, pp. xv + 746.
- R.S. MATHER "The Gravity Field and the Definition of Stationary Sea Surface Topography", *Veröffentlichungen des Zentralinstitut für Physik der Erde*, 30 (2), 1974, pp. 381-414.
- R.S. MATHER "Geoid Definitions for the Study of Sea Surface Topography from Satellite Altimetry." *Proc. of International Symposium on the Applications of Marine Geodesy*, Marine Technology Society, Washington, D.C., 1974, pp. 279-289.

- R.S. MATHER "Time Variations in Geodetic Co-ordinates", *Unisurv G20*, School of Surveying, Univ. of N.S.W., 1974, pp. 77-132.
- R.S. MATHER "On the Solution of the Geodetic Boundary Value Problem for the Definition of Sea Surface Topography", *Geophys. J.R. Astr. Soc. 29*, 1974, pp. 87-109.
- R.S. MATHER "Quasi-Stationary Sea Surface Topography and Variations of Mean Sea Level with Time - An Interim Compendium (1973)", *Unisurv G21*, 1974, pp. 18-73.
- M. MAUGHAN "Survey Computations", *Monograph No. 5*, School of Surveying, Univ. of N.S.W., 1975, pp. 1-96.
- A.J. ROBINSON & G.J.F. HOLDEN "Surveying Education in New South Wales", *Proc. of 8th National Survey Teachers' Conference*, Pennsylvania State Univ., 1974, pp. 1-11.
- A.J. ROBINSON "Field Investigations into the new Hewlett Packard Distance Meter", Paper presented to the *Fall Convention of the American Congress of Surveying and Mapping*, St. Louis, Missouri, 1974, pp. 505.2 1-5.
- A.J. ROBINSON "A Study of Zero Error and Ground Swing of the MR101 Tellurometer", *Unisurv S10*, School of Surveying, Univ. of N.S.W., 1974, pp. 1-200.
- A.J. ROBINSON "Investigations into methods of Electronic Distance Measurement", *Invited paper presented to the XIVth International Congress of Surveyors*, Washington, D.C., 1974.
- J.C. TRINDER "Procedure for the Selection of Ground Targets in Photogrammetry", *Unisurv G20*, School of Surveying, Univ. of N.S.W., 1974, pp. 33-76.
- J.C. TRINDER "Geometry of Multi-Spectral Scanner Imagery", *Proc. of 18th Survey Congress*, Perth, 1975, pp. 115-136.
- A.P.H. WERNER & E.G. ANDERSON "International Units (S.I. Units) in Gravimetry", *Proc. of Symposium on Earth's Gravitational Field and Secular Variations in Position*, School of Surveying, Univ. of N.S.W., 1974, pp. 699-701.

(d) Lectures etc.

At the International Symposium on the Redefinition of North American Geodetic Networks, held at Fredericton, Canada, May 1974, Associate Professor R.S. Mather read a paper entitled "Time Variations in Geodetic Co-ordinates" and Dr. J.S. Allman at the same symposium read a paper entitled "The Condition Method in the Adjustment of Large Networks".

Assoc. Professor R.S. Mather also presented a paper entitled "Geoid Determinations for the Definition of Sea Surface Topography from Satellite Altimetry" at the International Symposium on Marine Geodesy held at Columbus, Ohio, June 1974.

Assoc. Professor R.S. Mather gave a lecture to the Department of Aerospace Engineering, University of Texas at Austin "Use of Satellite Altimetry Data in Determinations of Sea Surface Topography" in May 1974.

Assoc. Professor R.S. Mather also gave a lecture to Geodynamics Branch, NASA/Goddard Space Flight Center, Greenbelt Md, U.S.A. "Gravity Field Improvement from Satellite Altimetry," May 1974.

A programme of Research Seminars in High Precision Geodesy and Physical Geodesy was held at the School of Surveying during July. Titles of the seminars were as follows:-

1. Earth Tide Effects in Geodesy by K. Bretreger.
2. Lunar Laser ranging and the reference frame problem by Dr. A. Stolz.
3. Polar Motion by Dr. P. Morgan of Division of National Mapping, Canberra.
4. The role of VLBI in Geodetic Determinations by I. Lloyd.
5. Computation of gravimetric deflections of the vertical by A.H.W. Kearsley
6. The earth's topography and compensation by E.G. Anderson
7. On the Evaluation of sea surface topography by Assoc. Professor R.S. Mather.

Assoc. Professor R.S. Mather lectured on "Reference Systems Requirements for Geodesy and Ocean Dynamics" at the International Astronomical Union Colloquium No. 26 at Torun, Poland, in August 1974.

Assoc. Professor R.S. Mather also gave a lecture on "Sea Surface Topography from Satellite Altimetry - Requirements for Surface Gravity Data" at the International Gravity Commission Quadrennial Assembly at Univ. of Paris in September.

Professor P.V. Angus-Leppan presented a paper entitled "Refraction over Snow and Ice Surfaces" at the IAG Symposium on Electronic Distance Measurement and Geodetic Refraction, at Stockholm in August 1974.

(e) Professional Activities

The following members of staff were appointed to the named Standing Sub-Committees - 1974, of the N.S.W. Division of the Institution of Surveyors, Australia:

Mr. A.H.W. Kearsley	Discussion Group
A/Prof. G.G. Bennett (Convenor)	Metric
Dr. J.S. Allman	Metric
Mr. A.P.H. Werner	Metric
Dr. J.S. Allman	Papers & Publications
Mr. J.G. Freislich	Papers & Publications
Dr. J.S. Allman	Programme
A/Prof. G.G. Bennett	Programme
Mr. J.G. Freislich	Programme
Prof. P.V. Angus-Leppan	Qualifications
A/Prof. G.G. Bennett	Qualifications
Mr. A.H.W. Kearsley	Student Liaison

Federal Committees:

A/Prof. G.G. Bennett	Membership & Qualifications
Mr. A.P.H. Werner	The Australian Surveyor.

Members of the School of Surveying made written submissions to Sir John Overall, the one-man Commission of Enquiry into the Integrated Survey System. They were:

Professor P.V. Angus-Leppan
 A/Professor G.G. Bennett
 Mr. J.G. Freislich
 Dr. J.C. Trinder
 Mr. A.P.H. Werner
 Mr. A.H.W. Kearsley

In addition, Professor Angus-Leppan and Mr. A.P.H. Werner were called to give verbal evidence before the Commission.

A Surveying School Committee has been set up to deal with academic matters. Membership includes academic staff, professional level non-academic staff, graduate students and six (6) undergraduate student representatives.

As Convenor of the Sub-Committee of the Reciprocating Survey Boards "Needs of the Profession", Dr. J.C. Trinder has investigated the output of surveyors required in the State of N.S.W. Based on statistical information and also on replies from a questionnaire, it appears that approximately 100 new surveyors will be required every year. There appears to be a shortage of at least 80 surveyors in the State of N.S.W. at present. The present output of approximately 30 - 40 graduates per year falls far short of the required 100, thus aggravating the shortage.

Mr. A.H.W. Kearsley has been appointed to a Sub-Committee of the N.S.W. Division of the Institution of Surveyors Australia to Draft Regulations for the proposed Integration Survey Act.

At the Conference of Reciprocating Surveyors' Boards of Australia and New Zealand, held in Melbourne, Professor P.V. Angus-Leppan was appointed to the Technical Committee on International Reciprocity and was appointed Convenor of the Committee on Assessment of Overseas Qualifications.

Dr. J.C. Trinder was a Member of a Panel Discussion on ERTS Imagery for the Remote Sensing Association in September, held in Sydney.

11. AWARDS

(a) Reference was made in the report to the Visiting Committee last year to the two Scholarships which the Institution of Surveyors, Australia, New South Wales Division, has offered to sponsor annually to Surveying Students in Parts 5-8 of the B. Surv. Course. The first awards under this scheme were made in 1975 to:

Mr. Dean Harold BOWRING and
Mr. Peter Norman GILKES

both students in the 3rd year of the Full Time course.

(b) The Gold Medal of the Board of Surveyors to the most distinguished graduand of 1975 is due to be awarded to Mr. Christopher Rizos, who graduates this year with Honours Class I, by the Surveyor General and President of the Board, Mr. L.N. Fletcher.

12. VISITORS TO THE UNIVERSITY.

Professor E.H. Thompson, was a Visiting Professor to the School of Surveying for 6 weeks in Session 2 of 1974. He is Head of the Department of Surveying and Photogrammetry at University College, London.

Dr. H.L. Oswal, Professor in the Department of Civil Engineering at Roorkee University, U.P. India, was Visiting Professor in the School of Surveying for 2 weeks in Session 1 of 1974.

Dr. M. Leupin, of Technical University, Lausanne and also of Leupin Surveys, Berne, is spending two months in the School of Surveying. He is lecturing and advising on research in photogrammetric block adjustment.

Mr. Dale Woodruff on route from a large Aero-Dist. Control Survey for Mapping in Tanzania.

Dr. G. Strasser from Wild Instrument Co., Heerbrugg, Switzerland, who gave a talk to staff and post graduate students on latest developments in e.d.m.

Dr. B. Ducarme of International Centre for Earth Tides, Brussels, Belgium.
Professor A. Hertzog and Mr. F.L. Clarke of Department of Civil Engineering, Newcastle University.

Mr. Allan Jones, Lecturer in Surveying and Photogrammetry at University of New England.

Messrs. R. Lovegrove, T. Meekin and A. Austin, Members of Executive of Association of Consulting Surveyors.

Mr. P.R. Zwart, Lecturer of Tasmanian College of Advanced Education.

Dr. P. Morgan and Mr. K. Leppert of Division of National Mapping, Canberra, attended to participate in a programme of Research Seminars.

Mr. P.J. Hunt, Senior Lecturer at University of Otago, Dunedin, N.Z.

Professor J.B. Thornton, Pro-Vice-Chancellor and Sir Hugh Springer, Secretary General of the Commonwealth Vice-Chancellor's Committee

Messrs. D. Stott and Bates of Australian Iron & Steel, Wollongong.

Professor G.H. Tomaddoni of Faculty of Agriculture, University of Tehran is on a 12-month visit to the Schools of Surveying and Civil Engineering.

Dr. Lo, Officer-in-Charge, Photogrammetry Section in Department of Geography, University of Hong Kong.

Dr. Robert Forrest of Bendix Research Laboratories, Michigan, USA.

Messrs. P. Price and J. Roberts, Surveyors, Nowra.

APPENDIX

UNISURV PUBLICATIONS (a list up to 1974)

- | | | | | |
|-----|--|--------|------------------|-------|
| 1* | The discrimination of radio time signals in Australia
G.G. Bennett | | UNICIV Rep. D-1 | (G1) |
| 2* | A comparator for the accurate measurement of differential
barometric pressure
J.S. Allman | 9 pp | UNICIV Rep. D-3 | (G2) |
| 3 | The establishment of geodetic gravity networks in South Australia
R.S. Mather | 26 pp | UNICIV Rep. R-17 | (G3) |
| 4. | The extension of the gravity field in South Australia
R.S. Mather | 26 pp | UNICIV Rep. R-19 | (G4) |
| 5* | An analysis of the reliability of barometric elevations
J.S. Allman | 335 pp | UNISURV Rep. 5 | (S1) |
| 6* | The free air geoid for South Australia and its relation to the
equipotential surfaces of the earth's gravitational field
R.S. Mather | 491 pp | UNISURV Rep. 6 | (S2) |
| 7* | Control for mapping (Proceedings of Conference, May, 1967)
P.V. Angus-Leppan (Editor) | 329 pp | UNISURV Rep. 7 | (G5) |
| 8* | The teaching of field astronomy
G.G. Bennett & J.G. Freislich | 30 pp | UNISURV Rep. 8 | (G6) |
| 9* | Photogrammetric pointing accuracy as a function of properties of
the visual image
J.C. Trinder | 64 pp | UNISURV Rep. 9 | (G7) |
| 10* | An experimental determination of refraction over an icefield
P.V. Angus-Leppan | 23 pp | UNISURV Rep.10 | (G8) |
| 11* | The non-regularised geoid and its relation to the telluroid and
regularised geoids
R.S. Mather | 49 pp | UNISURV Rep.11 | (G9) |
| 12* | The least squares adjustment of gyro-theodolite observations
G.G. Bennett | 53 pp | UNISURV Rep.12 | (G10) |
| 13* | The free air geoid for Australia from gravity data available in 1968
R.S. Mather | 38 pp | UNISURV Rep.13 | (G11) |
| 14* | Verification of geoidal solutions by the adjustment of control
networks using geocentric Cartesian co-ordinate systems
R.S. Mather | 42 pp | UNISURV Rep.14 | (G12) |
| 15* | New methods of observation with the Wild GAKI gyro-theodolite
G.G. Bennett | 68 pp | UNISURV Rep.15 | (G13) |
| 16* | Theoretical and practical study of a gyroscopic attachment for a
theodolite
G.G. Bennett | 343 pp | UNISURV Rep.16 | (S3) |
| 17* | Accuracy of monocular pointing to blurred photogrammetric signals
J.C. Trinder | 231 pp | UNISURV Rep.17 | (S4) |
| 18* | The computation of three dimensional Cartesian co-ordinates of
terrestrial networks by the use of local astronomic vector systems
A. Stolz | 47 pp | UNISURV Rep.18 | (G14) |

* *Out of Print*G *General Series*S *Special Series (Limited Printing)*

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|-----|--|--------|----------------|-------|
| 19. | The Australian geodetic datum in earth space
R.S. Mather | 130 pp | UNISURV Rep.19 | (G15) |
| 20. | The effect of the geoid on the Australian geodetic network
J.G. Fryer | 221 pp | UNISURV Rep.20 | (S5) |
| 21. | The registration and cadastral survey of native-held rural land in the Territory of Papua and New Guinea
G.F. Toft | 441 pp | UNISURV Rep.21 | (S6) |
| 22. | Communications from Australia to Section V, International Association of Geodesy, XV General Assembly, International Union of Geodesy & Geophysics, Moscow 1971
R.S. Mather et al | 72 pp | UNISURV Rep.22 | (G16) |
| 23. | The dynamics of temperature in surveying steel and invar measuring bands
A.H. Campbell | 195 pp | UNISURV Rep. | S7 |
| 24. | Three-D Cartesian co-ordinates of part of the Australian geodetic network by the use of local astronomic vector systems
A. Stolz | 182 pp | UNISURV Rep. | S8 |
| 25. | Papers on Four-dimensional Geodesy, Network Adjustments and Sea Surface Topography
R.S. Mather, H.L. Mitchell, A. Stolz | 73 pp | UNISURV Rep. | G17 |
| 26. | Papers on photogrammetry, co-ordinate systems for survey integration, geopotential networks and linear measurement
L. Berlin, G.J.F. Holden, P.V. Angus-Leppan, H.L. Mitchell and A. Campbell | 80 pp | UNISURV Rep. | G18 |
| 27. | Aspects of Four-dimensional Geodesy
R.S. Mather, P.V. Angus-Leppan, A. Stolz and I. Lloyd | 100 pp | UNISURV Rep. | G19 |
| 28. | Relations between MSL & Geodetic Levelling in Australia
H.L. Mitchell | 264 pp | UNISURV Rep. | S9 |

G General Series

S Special Series (Limited Printing)

Proceedings

Proceedings of conferences on refraction effects in geodesy & electronic distance measurement
P.V. Angus-Leppan (Editor) 264 pp

Monographs

1. The theory and geodetic use of some common projections (2nd edition)
R.S. Mather 125 pp
2. The analysis of the earth's gravity field
R.S. Mather 172 pp