La Trobe University Handbook 1973 Pt 2

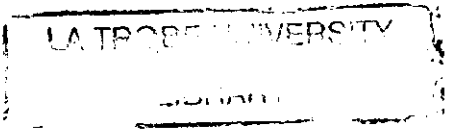
Schools of Agriculture, Biological Sciences, Physical Sciences, Department of Psychology

QUI·CHERCHE·TROUVE

La Trobe University Handbook 1973

SCHOOLS OF AGRICULTURE
BIOLOGICAL SCIENCES
PHYSICAL SCIENCES
DEPARTMENT OF PSYCHOLOGY

1972



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PART I: INTRODUCTION

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TERM DATES – 1973

FIRST TERM		
(10 weeks)	5 March	12 May
SECOND TERM		
(9 weeks)	4 June	4 August
THIRD TERM		
(7 weeks)	27 August	13 October

Examinations begin 29 October.

Note

1. The one-year Diploma in Education course commences on 26 February and Education II (concurrent course) commences on 28 February.
2. Some departments may require students to attend the University for out-of-term activities.

ENQUIRIES

All enquiries should be directed to:
The Registrar,
La Trobe University,
Bundoora,
Victoria, 3083.
Telephone enquiries: 478 3122
Admission enquiries: Student Administration, 478 3122, extension 2738.

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	Smith, R.F.I. MA (ADEL), PH D (ANU)
Senior Tutors	Georgiou, P. BA (MELB)
	McCoppin, G. Brigid BA (MELB)
	Filar, Patricia BA (MELB)
	Garland, P. BA (MELB)

SOCIOLOGY

Professors	Martin, Jean I. MA (SYD), PH D (ANU) *Chairman*
	Veliz, C. B SC, PH D (LOND) FRHISTS
Reader	Edgar, D.E. BA, M ED (MELB), PH D (STAN)
Senior Lecturers	Balmer, C.J. BA (TAS), ED D (FLOR)
	Cubbon, H.A. MA (CANTAB), PH D (MELB)
	Dempsey, K.C. BA (SYD), DIP ED, PH D (NE)
	Hickman, D.C. BA, B ED (MELB), PH D (ANU)
	Ireland, R.H. BA (MELB), PH D (HARV)
	Mulligan, D.G. MA (NZ), PH D (LOND)
	Rose, G. MA (OXON), MA (CANTAB)
	Schutte, H. DIPL HDL (COLOGNE), DR SC POL (KIEL)
	Trahair, R.C.S. BA, PH D (MELB)
Lecturers	FitzGerald, J.M. LL B (MELB), LL M, MA, PH D (NORTH WESTERN)
	Inglis, Christine BA (SYD), MA (ANU)
	Kilmartin, L.A. BA (QLD)
	Kitaoji, H. BA (INTERNATIONAL CHRISTIAN) MA (TEXA
	Lauderdale, Sandra M. BA (COLOR), MA (CORN)
	Otto, Rosemarie BA, DIP SOC STUD (MELB)
	Richards, Marilyn G. BA (ADEL), MA (LA TROBE)
	Richmond, Catherine M.G. BA (MELB), MA (ANU)
	Ternowetsky, G.W. BA (WINNIPEG), MA (CALGARY)
Senior Tutors	Harper, Janice M. BA (SYD)
	Harvey, Susan D. BA (WA), DIP SOC STUD (SYD), MA (ANU)
	Taylor, Evelyn J.S. BA (MON)

Tutor	Sgro, Diane BA, DIP ED (LA TROBE)
Visiting Fellow	Bell, R.R. BA (MICH STATE), MA (INDIANA)

SENIOR LIBRARY STAFF

Chief Librarian	Borchardt, D.H. MA (NZ), DIP NZ LIB SCH, ALA (UK), FLAA

Readers Services

Assoc. Librarian	Scrivener, J.E. BA, DIP ED (TAS), ALA (UK), ALAA
Senior Reference Librarian	Choate, C.R. BA (WYOM), MS IN LS (COLUMBIA)
Reference Librarian	

Selection

Senior Librarian	Barraclough, H.C. BA (MELB), MA (CALIF) ALAA

Serials

Librarian	Longley, Pamela R. BA (TAS), ALAA

Technical Services

Assoc. Librarian	Stecher, G. BA (MELB), BLS (MCGILL), ALAA
Senior Librarian	McKinlay, J.W. BA (TAS), ALAA
Librarians	Hoffman, Helen K. BA (MELB), ALAA
	Horecek, J.I. BA (MELB), MA (LOND), ALAA

SENIOR ADMINISTRATIVE AND COLLEGE STAFF

Vice-Chancellor	Myers, D.M. B SC, D SC ENG (SYD), FIEE, FIE AUST, F INST P
Registrar	Taylor, Maj-Gen. T.S. CBE, MVO, MC
Deputy Registrar	Griffith, D.A.C. TD, B SC (ENG) (LOND), AFAIM
Assistant Registrar	Kennard, D.N. BA (NE), AAIM
Staff Officer	Tolhurst, N.M.
Council Executive Officer	Sewell, S.M. BD (LOND), MA (HARTFORD)

Publications and Information Officer	Segrave, R.W. MAIE, AMICIE, MPRIA
Business Manager	Janicke, J.C. BA, DIP ED (MELB)
Chief Accountant	Henley, J.W. FASA, FCIS
Assistant Chief Accountant	Gruer, E.F. FASA
Buildings Officer	Russell, T.C.C. ARIBA, ARAIA

Chisholm College

Head	Morrison, Prof. J.D. PH D, D SC (GLAS), FAA, FRACI
Bursar	Broderick, Lucille M.

Glenn College

President	Oates, S. BA, B ED (MELB), TPTC
Secretary	Bodey, N.H.

Menzies College

Chairman	Lovegrove, M.N. BA (NZ), MA, PH D (AUCK), ABPSS
Manager	Star, J.C.

Computer Centre

Manager	Edwards, J.A. BA (KEELE)

University Advisory Services

Health Service

Physician-in-Charge	Semmens, K. MB, BS (MELB), DTMH (LOND)

Counselling Service

Counsellor	Bailey, C.F. B ECON (SYD), DIP PSYCH (MELB)

Careers and Appointments Service

Adviser	Waterhouse, J.L. B COMM (MELB)

INTRODUCTION

La Trobe University, which admitted its first students in March 1967, is the youngest of the three Victorian universities and, at present, the smallest in terms of student enrolments. Its 500-acre site at Bundoora, nine miles north-east of the City of Melbourne, was however selected with a view to its capacity to provide the space necessary for the eventual development of a large institution. To meet the State's urgent need for increased university places it was necessary to plan for a rapid growth in student enrolments in the first few years of the University's existence. From an initial enrolment of 500 in 1967, total enrolments rose to 4,304 in 1972 and are expected to reach approximately 7,000 by 1975.

The University was established when the Parliament of Victoria passed the La Trobe University Act No.7189 of 1964. The provisions of the Act were based principally on recommendations made by a committee appointed by the government in May 1964 under the chairmanship of Mr J.R.A. (now Sir Archibald) Glenn.

The University is named after Charles Joseph La Trobe (1801-1875), who was appointed as first Lieutenant-Governor of the new Colony of Victoria in 1851.

For the first two years responsibility for the planning of the new institution rested with an Interim Council. The first Council of the University took office in December 1966 and elected as Chancellor Sir Archibald Glenn who retained this office until July 1972 when he was succeeded by the Hon. Mr Justice Smithers. The University was formally opened by His Excellency the Governor of Victoria, Major-General Sir Rohan Delacombe, at a ceremony on 8 March 1967 during which Sir Archibald Glenn was installed as Chancellor by the then Premier of Victoria, Sir Henry Bolte.

The Council, which is the governing authority of the University, has 31 members including the Chancellor, the Vice-Chancellor, the deputy chairman of the Academic Board, the President of the Students' Representative Council and a Deputy Director General of Education. Of the remaining 26 members, nine are appointed by the Governor in Council, seven are co-opted by Council itself, four are elected by University staff, three are elected by the Academic Board, and three are elected by students. The senior academic body, the Academic Board, has the principal responsibility of making recommendations to Council on all matters of academic policy. These recommendations are framed in the

light of advice which the Board receives from its various standing committees and from the boards of studies of the several Schools, which are the academic units into which the University is divided.

There are at present six Schools. Of these, four (biological sciences, humanities, physical sciences and social sciences) were established before the University opened in 1967. Since then two professionally oriented Schools have been added – the School of Agriculture in 1968 and the School of Education in 1970. The department of psychology (which offered its first courses in 1972) is not at present attached to any of the existing Schools but will become part of the School of Behavioural Sciences when that School is established.

In 1972 enrolments in the six Schools and the department of psychology were as follows:

	Bachelor degree	Higher degree	Diploma in Education	Other	Total
Agriculture	180	8	–	1	189
Biological Sciences	316	28	–	4	348
Education	134	33	335	10	512
Humanities	1334	60	–	15	1409
Physical Sciences	458	76	–	12	546
Social Sciences	1132	58	–	36	1226
Psychology	70	2	–	2	74
Total	3624	265	335	80	4304

The University held the first ceremony for the conferring of degrees in December 1969 when 144 graduands received their testamurs from the Chancellor and a further 28 were admitted to degrees *in absentia.* In subsequent years it has been necessary to hold two ceremonies annually for the conferring of degrees and diplomas on increasing numbers of graduands.

The staff of the University has steadily increased since 1967 to meet the needs of the growing body of students. In 1972 there were 313 full time and 137 part-time staff directly engaged in teaching and research.

DEVELOPMENT

Beginning modestly in 1965 the University's building program up to the end of 1972 has resulted in the completion of approximately 40 per cent of the ultimate development.

Glenn College and the first stage of the Library had to accommodate the initial intake of students in 1967. Since that date facilities have been added to provide permanent homes for five Schools, (Humanities, Social Sciences, Biological Sciences, Physical Sciences and Agriculture) and administration.

Building projects completed in 1972 included the agora theatre (500 seats), south building, agriculture, extension to physics and the western building of the agora development.

Projects under the 1970-72 triennium program to be completed and occupied early in 1973 are the extensions to Glenn and Menzies colleges, General Union building, north west annexe and a second stage development of Waterdale Road staff and students flats.

LIBRARY

The collections and services of the library are being developed to support the teaching and research programs of the University. During the early stage in its growth emphasis has been placed on the provision of books and periodicals directly relating to the subjects being taught. In 1973 the holdings will be approximately 170,000 volumes of books and periodicals and some 30,000 volumes will be added during the year.

The library building, which is located on the northern side of the agora in the centre of the academic buildings, is designed to house up to 240,000 volumes and 1,800 readers. The main entry to the building is from the concourse on the second level, and on this floor most service functions are located – the public catalogues, the reference collection and reference service point, the loans desk, the reserve book collection, and offices and workrooms for the library staff. Level three houses the general collection and the main reading area, including 32 lockable carrells for the use of research students. Level one houses the serials collection with its associated display and reading areas, the serials and government documents workroom, the research collection (which includes government documents) and its reading area, the special collections room and the microfilm collection and reading area.

A fuller description of the library and of the services it offers to students is contained in the *Introductory Guide to the Library.* The rules governing use of the library are set out in the University's Regulation 20.2(1) *Use of the Library.* All students should provide themselves with the Guide and the regulations, copies of which may be had from the loans desk.

The librarians of the reference section give individual assistance to students when requested and in co-operation with the Schools give courses of instruction in library use and subject bibliography.

THE COLLEGES

The three colleges of the University each provide a number of study bedrooms for residential students. Glenn College, which has been in operation since the opening of the University in 1967, and Menzies College which opened the following year, also provide common dining, social and recreational facilities. In Chisholm College, which opened in 1972, study bedrooms are arranged in groups of 8 to 12, each group having its own kitchen and dining area where residents may prepare and eat their meals. No central catering is provided in this college and the residence fee covers the cost of room only.

Application for College Residence

In addition to the application to enrol at the University, a separate application is required for residential accommodation in either Glenn College, Menzies College or Chisholm College. Further information and application forms may be obtained by writing to:

The Student Accommodation Office,
La Trobe University,
Bundoora, Victoria 3083.

Completed applications for college residence in the following year should as far as possible be lodged with the Student Accommodation Office during December, when information about the level of residence fees in each college will be available.

UNIVERSITY HEALTH SERVICE

Physician-in-charge: Dr K. Semmens
Physician: Dr R. Hall
Nursing Sister: Miss Nina Sedlmayr
Secretary/Receptionist: Mrs Sheila Harris

The University Health Service is located on level one of the north-east annex to the south building.

For students and staff the University Health Service provides the opportunity to discuss medical problems, vaccination before overseas travel, insurance medical examinations, and first-aid care in case of accident or medical emergency on campus. Treatment for illness may be provided, or the patient may be referred to a more appropriate place for further care. Immunization against tetanus, poliomyelitis, etc., is available.

Sports injuries may be treated initially in the sports pavilion by honorary *sports medicine physicians* but subsequent treatment is obtained either from private physicians or from the Health Service. An orthopaedic surgeon may be consulted in an honorary capacity during his weekly visit to the Health Service. Physiotherapists attend daily, their charges being reimbursed by the Sports Union insurance company.

For students, the University Health Service hopes to be of use particularly where ill-health or worry is interfering with studies, and where the stresses of undergraduate life are having an effect on a student's health.

The Health Service is open during normal University hours. No charges are made. Consultation by appointment. Minor conditions may be seen without appointment in Casualty Department between 9.30 am and 12.30 pm, and 2.30 pm and 5 pm.

UNIVERSITY COUNSELLING SERVICE

Counsellors: Mr C.F. Bailey, Mr Terry O'Neill
Secretary: Miss Jennifer Williamson

The function of the Counselling Service is to offer help, either individually or in groups, to students who are having such difficulties as defining their vocational goals, settling down to the business of effective study, adjusting to life at university, or dealing with their personal problems.

The service is available with (but in an emergency without) an appointment to any member of the University and to those who are interested in becoming students. Appointments can be made in person or by telephon-

ing extension 2957 or 2958. The counselling unit is located with the other advisory services on the ground floor of the north-east annex of the south building between the humanities building and the south building.

CAREERS AND APPOINTMENTS

Adviser: Mr John Waterhouse
Assistant to Adviser:
Secretary:

The Careers and Appointments Service helps an undergraduate to clarify and achieve his vocational goals. The service offers advice and information to enable the student to be realistically aware of the facts and problems of career opportunities, thus equipping him to accept responsibility for his own future. It assists those seeking graduate employment, and may be of help to students who are looking for vacation work, or part-time work during the academic year, or positions in which they can make the best use of a partially completed degree course. Advice about careers open to graduates may also be of use to those who are involved in choosing between possible university courses or still completing their final year at school.

STUDENT HOUSING SERVICE

Student Housing Officer: Mrs Betty Collings
Secretary: Mrs Carmen Axisa

The Student Housing Service is provided to assist students in finding accommodation other than in colleges, and to advise on any relevant problems such as types available, costs, suitable areas, transport, etc.

Offers of accommodation for students are visited wherever possible to ensure reasonable domestic and study facilities, and a permanent listing of available places is kept throughout the year. These vary from furnished rooms (from $9 a week) to private board (from $16 a week), or varying arrangements between the two, to suit a particular student's needs.

There is also a limited number of University flats available to students. These are mostly two-bedroom, furnished flats. General information about other flats and houses for rental in the area is provided.

Country students should allow sufficient time to locate suitable places (possibly an overnight stay in Melbourne) and private transport is invaluable when doing so.

Enquiries should be directed to the Student Accommodation Office, La Trobe University, Bundoora, 3083. Telephone 478 3122.

STUDENT LOANS

The resources of the students' loan fund are limited. The students' loan fund committee expects that, in 1973, it will be able to assist only those students whose financial difficulties are considerable and who require loans to enable them to pay fees, purchase prescribed books and equipment and provide essential living expenses. Preference is given to later-year students to enable them to complete their degree. A loan cannot be made to assist a student with the purchase or repair of a motor vehicle. It is the committee's policy that a loan should supplement other income and not serve as a student's primary source of funds.

During 1972 the committee adopted a policy under which it would advance no more than $550 to a student during one academic year with a maximum of not more than $1,100 during a course. In 1973, because of the limitation on funds it may not be possible to lend the full amount of $550 unless there are very special circumstances. When approving a loan application the committee specifies the period within which the loan must be repaid. In setting this period the committee takes account of a student's overall financial position and the amount of the loan. Long-term loans must be repaid within two years of the completion of a course or withdrawal from the University. Shorter periods apply to other types of loan (emergency, short-term, medium-term). The amount of interest charged on a student loan varies according to the repayment period set. An applicant must nominate a guarantor for a medium or long-term loan.

The committee may recommend to the Bank of New South Wales that it grant a supplementary loan of up to $300 on the basis of $2 for $1 from the fund. Interest is charged on the bank loan at a concessional rate.

A list of persons who may approve short-term (up to $50, repaid within two months) and emergency (up to $10, repaid within two weeks) loans is displayed on the official noticeboard.

Enquiries regarding all types of student loans should be directed to the secretary of the students' loan fund committee, Registrar's Department.

LA TROBE BURSARIES

The Council of La Trobe University has established a bursary fund which will be administered by the students' loan fund committee. From the fund the committee will award, in 1973, La Trobe bursaries to approximately fifteen persons from among those prospective full-time undergraduates who will be unable to take up an offer of a place at the University because of insufficient financial support. A bursary will provide free tuition, cover the payment of other compulsory fees and provide a living allowance of $800 a year.

An applicant for a La Trobe bursary may not hold concurrently a cadetship, studentship, Commonwealth university scholarship or similar award. He will be ineligible if he has been a student at a tertiary institution. Bursaries will be granted strictly on the basis of need.

Further information is available from the secretary of the students' loan fund committee, Registrar's Department.

COMPUTER CENTRE

Manager: Mr J. Edwards

The University Computer Centre is equipped with a small PDP-9 computer and a PDP-15 computer. The PDP-9 is designed to service, on line, various research experiments and to provide an interpretive single-user console system. The PDP-15 provides facilities for student batch and research processing. It has 16,000 words of memory, disc storage of one half million words, two DECtape units, two industry compatible magnetic tape units, card reader and line printer. The centre is located on the ground floor of the chemistry building (next to the library).

Service courses both in programming and in operating are provided by the centre for academic departments. Additional courses are open to students and staff. Information about these courses will be posted on the official notice board.

THE LA TROBE UNIVERSITY BOOKSHOP

The La Trobe University bookshop is owned by the University. The shop, located on the eastern side of the agora, is the largest in the northern suburbs and one of the best in Melbourne.

The bookshop stocks all text books prescribed or recommended for

study in the many courses offered at La Trobe, as well as a liberal range of general reading involving an extensive range of fiction and of reference works. There is a choice of children's books and a special and up-to-date section for current and topical releases. A variety of stationery, pens, records and magazines is also available.

The bookshop has a carefully controlled credit system for those who wish to pay for their purchases on a monthly basis. A special order service and a reservation service are also offered. The former enables a customer to order types of books not normally held in stock; the latter allows customers to reserve books that are already on order. When they arrive a copy is put aside and the customer notified that the books can be collected.

The bookshop is controlled by a board of management representing various interests within the University. The board comprises five students appointed by the Students' Representative Council, and one representative of the academic staff, the Business Manager's Department and the Library. The bookshop manager is a member of the board, and there is a professional outside consultant. At present, the chairman of the board is a student.

Any enquiries about the bookshop should, in the first instance, be directed to the manager.

CHILD CARE CENTRE

La Trobe University child care centre opened towards the end of the 1971 academic year. A management committee of users of the centre is elected in April of each year.

The Centre accepts children in the age range six weeks to five years for full-time or part-time care. A kindergarten program is provided for children in the three to five age group in two sessions a day.

The present centre caters for 32 children but will soon be expanded to accept 60 children; 35 in the under three age group and 25 in the three to five age group. Bookings for 1973 should be made as soon as possible and all enquiries should be made to the Directress, Mrs Shaw, telephone 467 3819.

Fees

	Hour	Day	Week
Salary above $5000	.50	3.00	14.00
Salary below $5000	.35	2.50	11.50

SPORTS UNION

The La Trobe University Sports Union was established in 1967 to assist and co-ordinate the establishment and administration of the various sporting clubs.

The Sports Union Council consists of a delegate from each club. The Sports Union executive committee, elected from Sports Union Council members, administers, through the executive secretary, the running of the Sports Union.

Sports Union policy is to encourage participation in a wide range of sporting activities by its members (students and staff) of the University community by the provision of facilities and equipment for both recreational and competitive sporting activities. All participants are covered by comprehensive insurance while engaged in sporting activities.

The first capital grant from the Australian Universities Commission provided for the establishment of the sports pavilion and the development of the permanent playing fields to their present stage. The first stage of the indoor sports centre is located north-east of Glenn College, the indoor field house being 80 feet by 100 feet and suitable for a wide range of indoor activities. The present squash courts (two) are to be increased in number to a total of six, to cater more adequately for the demand of Sports Union members. The offices of the Sports Union (temporary) are situated within these buildings. Much emphasis is placed on the availability of facilities to members, the centre at present opening weekdays, 7 am to 12 midnight, Saturdays 8 am to 9 pm and Sundays 10 am to 10 pm.

The development of further permanent sports areas and facilities is taking place in the south-western section of the site in addition to the 13 acres already established.

Although a relatively small student population exists at La Trobe, a wide variety of sporting clubs is functioning. The following clubs are available to members this year: aikido, athletics, Australian rules football, badminton, baseball, basketball (mens international rules), basketball (womens international rules), boxing, canoeing, cricket, equestrian, fencing, golf, hockey (mens), hockey (womens), judo, karate, lacrosse, lawn tennis, mountaineering, netball, rifle, rowing, rugby, skiing, skin-diving, sky-diving, softball, squash, surf-riding, table tennis, volleyball, weightlifting and yachting. Clubs enter teams in inter-varsity, intra-varsity and local competitions. The Sports Union also provides recreational sessions for those wishing to take part in a variety of activities on a 'drop-in-and-have-a-go' basis.

STUDENTS' REPRESENTATIVE COUNCIL

The SRC consists of 19 members elected by and from all students (full-time, part-time, postgraduate and undergraduate) and exists to 'represent the students of the University on all matters affecting their interests'. The staff consists of an administrative secretary, a stenographer, a typist and a part-time accountant. Offices are situated in the agora, but early in 1973 the SRC will take up new quarters in the Union building.

A general election is held annually within the first four weeks of second term. Of the 19 SRC elected members, 13 are elected by the SRC to hold portfolios. They are: president, honorary secretary, treasurer, publications committee chairman, activities committee chairman, facilities planning and management committee chairman, AUS education committee chairman, clubs and societies committee chairman, constitutional and legal affairs committee chairman, housing and advisory services committee chairman, AUS committee chairman, public affairs committee chairman and academic affairs committee chairman.

The SRC promotes the social, cultural and intellectual life of the University through such activities as balls, forums and guest speakers, by the organization of orientation, by supporting more than 50 clubs and societies, and by publishing a weekly newsletter, a magazine and tri-weekly newspaper.

In addition, the SRC provides its own legal advisory service free of charge to all La Trobe University students.

Early in 1973, a referendum of students will be held to determine La Trobe's membership in the Australian Union of Students.

The SRC is available to all students and it is hoped first-year students particularly will acquaint themselves with the SRC. Any ideas or interest are welcomed.

Clubs and Societies

A university course includes more than academic study and the following clubs and societies are registered with the SRC. Membership is open to all students.

Agriculture Students, Anarchists, Arts Co-op, Asian Students Association, Alternate Social Sciences, Ballroom Dancing, Chemical Society, Chess Club, China Society, Christian Union, Comm. Social Responsibility, Communist Club, Community Aid Abroad, Conservation Society, Democratic Club, Draft Resisters' Union, Ecological Society, Economics Society, Fabian Society, Film Production Group, Film Society, Folk Club, Forum,

French Club, Historical Society, Jewish Students, Labour Club, Literary Society, Moderate Student Alliance, Modern Ballet, Motor Cycle Club, Music Society, Muslim Union, Newman Society, Papua-New Guinea Society, Photographic Club, Physics Society, Social Involvement, Strawberry, Student Christian Movement, Students for a Democratic Society, La Trobe University Student Theatre, Women's Liberation, World University Service, Yoga Society.

Rabelais

The student newspaper of La Trobe University, *Rabelais* is designed to provide news, information on campus activities and articles of general interest. It is edited and staffed by students and financed by the SRC and advertising. Twelve editions are published throughout the year, plus a special election edition of photographs and policy speeches of students standing for election to the SRC.

The editor is elected at the beginning of the year for the first six editions – another election is then held for editor for the final six.

THE UNION

The term *Union* goes back to Cambridge and Oxford where groups of students united to form debating clubs or debating unions. Facilities such as lounges, coffee rooms, toilets naturally were necessary. Modern Unions are designed as social, cultural and recreational centres within the University.

All students in 1973 will be members of the La Trobe University Union. Membership will also be open to staff and other approved people.

The new Union building will be open in time for orientation 1973. It includes two large dining halls, a fast snack bar/coffee bar, browsing library, listening facilities, billiards, table tennis, meeting rooms, private dining rooms and lounges.

The building will have full facilities for most extra-curricular activities including the Union's program of activities and entertainment.

It is hoped that by March 1974 the Union will have a liquor licence which will allow a large basement bar, a small tavern bar and a bar in one of the dining halls.

General enquiries about the Union should be made to the Secretary/Manager, Mr Arthur Hayes. Enquiries on extra-curricular activities and tuition courses should go to the activities officer, Mr Bruce Sims.

COMMONWEALTH UNIVERSITY SCHOLARSHIPS

Commonwealth university scholarships are available in all first degree courses and in the Diploma of Education course. The courses approved can be taken by part-time study as well as full-time study. In general, selected students will be free to apply their scholarships to any single approved course. Students interested in combined courses should seek advice from the Department of Education and Science.

The closing date for an application is 30 September.

Awards of university scholarships are made in three categories, (a) open entrance, (b) later year and (c) mature age.

Open Entrance

Open to students under 30 years who are permanent residents of Australia and who are doing or have done matriculation. Awarded on the basis of results in the four best subjects at the higher school certificate examination in four or more subjects. However, an adjustment is made in respect of additional subjects taken and account is taken of whether a student is repeating the examination.

Later Year

Open to undergraduates in any year of their course who are under 30 years of age and permanent residents of Australia and who have completed the equivalent of at least one year of full-time study in an approved course. Awarded on the basis of results gained from the commencement of the applicant's first approved university course.

Mature Age

Open to students who are over the age of 30 years and under 40 years of age and who are permanent residents of Australia. Awarded either on results obtained in the higher school certificate examination or, if the applicant has already commenced an approved university course, on his academic record in the course.

Benefits

All compulsory fees will be paid irrespective of the means of the scholar's parents. In addition, scholars who are undertaking full-time courses on a full-time basis may apply for a living allowance which will be subject to a means test. Allowances are paid on a graduated scale, the maximum allowance being $800 a year for students living at home and

$1,300 a year for students living away from home under approved circumstances.

The maximum allowance is payable where the family's income is $4,200 a year or less and some allowance is payable on a reducing scale up to an income of $7,950 a year for students living at home and $9,766 a year for students living away from home. These conditions are reviewed annually.

Number available

Open entrance:	9,500 throughout Australia.
Later year:	5,000 throughout Australia.
Mature age:	A small number only is available.

There is no contract of service.

Further information may be obtained from the Regional Director, Department of Education and Science, 450 St Kilda Road, Melbourne, Vic. 3004.

LA TROBE UNIVERSITY RESEARCH SCHOLARSHIPS

A number of research scholarships will be awarded in 1973, tenable at La Trobe University.

Eligibility

Applicants are expected to have graduated with first-class or upper second-class honours, or equivalent qualifications, from a recognized university. Final-year students are eligible to apply.

Research

The purpose of the scholarship is to enable scholars to carry out under supervision, a program of full-time advanced study and research, in a field approved by the University, leading to one of the following higher degrees: Master of Agricultural Science, Master of Arts, Master of Economics, Master of Education, Master of Science or Doctor of Philosophy.

In allocating scholarships, account will be taken of the suitability of the proposed research project in terms of the supervision and facilities available in the particular discipline.

If an applicant's proposed course of research will require knowledge of any language other than English, he should attach a note giving details of his present level of knowledge of the relevant language covering speaking, reading and writing ability.

Tenure

Scholarships are tenable as follows:

Masters candidates – up to a maximum period of two years.

Ph D candidates:

(i) Normally up to a maximum period of three years. (Only when exceptional academic circumstances have arisen is it possible to extend a scholarship beyond three years. Such extension will be for the period necessitated by the circumstances of the particular case and will not exceed 12 months.)

(ii) If a masters degree candidate is granted approval to upgrade his candidature to Ph D, his award may be extended to three years.

The scholarship is tenable in the first instance from the date of beginning work at the University (usually 1 March) until 31 December of the same year, but is renewable on 1 January each year, subject to satisfactory progress up to the maximum period shown above.

The scholarship may be terminated at any time by the research committee should the scholarship holder fail to pursue a program of full-time study and research.

Stipend

Stipend for master's and Ph D scholarships will be paid at the rate of $2,500 a year. Stipends are exempt from income tax.

Other Allowances

The following special allowances may be claimed:

(i) Married scholar with dependent wife and one child, $500 a year;

(ii) For each additional child to a total of three in all, $100 a year;

(iii) In special circumstances consideration may be given by the University to granting assistance to married scholars without children, up to $300 a year;

(iv) The University may give consideration to the granting of assistance in special cases other than those specified above, e.g. for a married woman scholar with a child and dependent husband;

(v) Exemption from compulsory University fees;

(vi) Thesis allowance, up to $100.
(Where two theses are submitted, Master followed by Ph D, two claims may be made but the total will not exceed $100.)

Additional University Work

Scholars will be regarded as full-time research students, but may be allowed to undertake teaching duties provided that such duties do not interfere with a scholar's study program. Generally such duties may not exceed six hours a week or 180 hours in a calendar year (this includes the time required for preparation and marking).

Applications

Applications for a La Trobe University Research Scholarship should be made in triplicate on the appropriate application forms.

Completed application forms should be lodged with the Graduate Studies Officer as soon as possible and, in any event, not later than 31 October.

Academic Record

Three copies of an official statement from the applicant's University of his academic record *must be included* with the application papers. If an applicant has a final result pending, he should send a copy of his academic record showing his examination results to date. (This does not apply to La Trobe students.)

COMMONWEALTH POSTGRADUATE AWARDS

Research Awards

The Commonwealth Government each year makes available a number of postgraduate awards which are allocated amongst the universities by the Department of Education and Science.

Applicants must be permanent residents of Australia at the time of application. Overseas students coming to Australia to begin a postgraduate course are not eligible for awards.

Applicants should have graduated or expect to graduate with at least upper division second-class honours in their bachelor degree courses or possess equivalent qualifications.

The maximum tenure of awards is two years for students proceeding to a master's degree and three years with possible renewal for a fourth year for students proceeding to a doctorate.

The stipend is $2,900 a year, plus a dependants' allowance of $650 a year (for wife and one child) and $234 for each additional child.

In addition to the stipend, travelling, settling in and thesis allowance will be paid.

Applications for a Commonwealth Postgraduate Award should be made in triplicate on the appropriate application form which may be obtained from the University. Applications should be lodged with the Graduate Studies Officer not later than 31 October.

Course Awards

Special awards are offered by the Commonwealth Government for students wishing to undertake full-time postgraduate study leading to a Master's degree by course work.

Applicants must be permanent residents of Australia at the time of application. Students from overseas who have permanent residence status in Australia and who declare their intention to remain in Australia after completion of their studies are also eligible. Such students must be resident in Australia at the time of application.

Applicants should have an undergraduate record at better than pass level. In general applicants should not have a break in their studies of more than ten years from the year of graduation.

Scholarship benefits are continued for the duration of the scholar's course, subject to satisfactory progress. Scholars are expected to complete their courses in the minimum time.

The stipend is $2,900 a year, plus a dependant's allowance of $650 a year (for wife and one child), $234 for each additional child.

In addition to stipend, travelling, establishment fees and other allowances will be paid.

Applications for a Commonwealth Postgraduate Course Award should be made on the appropriate form available from the University.

Applications close with the Graduate Studies Officer on 30 September.

EDUCATION DEPARTMENT STUDENTSHIPS

Education Department studentships are available for approved courses for a degree and Diploma in Education. They are available to students in all Schools at La Trobe University and are awarded to be taken up at the beginning of any year of the course. They are for full-time study only and are for the minimum period required to complete the course.

The studentship may be extended to include the fourth year of an honours degree.

Benefits

The award pays tuition fees and an allowance of $1,475 a year for first-year students, rising to $1,925 in the fourth year, with $100 additional for those living away from home. For undergraduate and graduate entrants the allowances are:

Completed first year:	$1,900 – $2,340
Completed second year:	$2,640 – $2,820
Completed degree:	$3,380

There are separate rates for those with dependants.

In addition, the award constitutes appointment into the State teaching service with an assured position as a permanent teacher after qualifying for the Diploma in Education.

A student who accepts a studentship is required to enter into an agreement which requires service with the Education Department for three years after completing the course, or one year in the case of graduate awards.

Further information is available from The Principal, Teachers' College, La Trobe University.

NATIONAL SERVICE

A student liable for national service who requires a certificate of enrolment on his deferment claim form should lodge this form for endorsement at the counter of the Student Administration branch.

The University can certify only a student's current enrolment. If a further course is planned Part D of the form should be completed or a separate statement attached. This does not apply to a student who is enrolled for a concurrent course (BA, B Ec, B Agr Sc, with the Dip Ed course).

The following remarks summarise the present deferment policy of the Commonwealth Department of Labour and National Service.

Deferment is usually granted to a student to complete a course for which he is enrolled at the time of registration, subject to the overriding qualification that the ground of deferment does not prejudice the student's rendering of service, liability for which now ceases at the age of 30 years. This covers all students, both undergraduate and postgraduate.

Every deferment is granted on the condition that it will be reviewed annually, and that the student must continue to make satisfactory academic progress. A student who has been granted deferment will be liable to undertake national service on termination of that deferment.

Where preferred, a student required to register may elect to serve in the Citizen Forces (Citizen Naval Forces, Citizen Military Forces, and Citizen Air Force) as an alternative to National Service. This option is open to those who are already serving and to those who intend to make immediate application for enlistment. In each case the undertaking to serve for a specified period, normally five years, except for Victorian University Squadron which is seven years, must be completed and signed before the ballot for a registrant's particular age group. Those who continue to serve efficiently and continuously for this period will not be required for national service.

The information sheet which is a section of the registration form explains these deferments in more detail. Further information may be obtained from the Commonwealth Department of Labour and National Service, National Service Registration Office, Princes Gate Building, 151 Flinders Street, Melbourne, 3000, or any district employment office of the Commonwealth employment service.

PUBLIC TRANSPORT

Copies of bus timetables and fare concession application forms are available at the Student Administration Branch. Buses leave the campus from the south building. For information on tram, train and bus services in the metropolitan area, ring the transport information centre on 63 0141. For services in the country, ring 63 0202.

Bus Routes to the University

(*Indicates a connection with the rail and tram routes mentioned below):

Melbourne and Metropolitan Tramways Board route:

City – Russell Street (terminus at Bourke Street), Rathdowne Street (Exhibition Buildings), North Carlton, North Fitzroy, Clifton Hill, Dennis*, Northcote, Fairfield, Ivanhoe, West Heidelberg, La Trobe University;

Ivanhoe Bus Company route:

Deepdene (Burke Road tram terminus), Ivanhoe railway station*, Heidelberg Repatriation Hospital, West Heidelberg, La Trobe University.

Dyson's Bus Service routes:

(i) Regent railway station* or Northland, East Preston tram terminus*, La Trobe University, Janefield.

(ii) Regent railway station* or Northland, East Preston tram terminus*, La Trobe University, Greensborough railway station*.

(iii) Regent railway station* or Northland, East Preston tram terminus*, La Trobe University, Watsonia railway station*, North Watsonia.

The majority of Dyson's services do not enter the campus.

Mees' Bus Lines route:

East Rosanna (corner of Graham and Warren roads), Macleod railway station*, La Trobe University.

Rail

1. Princes Bridge to Heidelberg and Hurstbridge railway line. Bus services depart from Ivanhoe, Macleod, Watsonia and Greensborough railway stations for La Trobe University.
2. Princes Bridge to Reservoir and Epping railway line. Buses link Regent railway station with La Trobe University.

Tram

Bourke Street to East Preston tram line. Buses link the East Preston tram terminus with La Trobe University.

UNDERGRADUATES – ADMISSION TO A COURSE

Entrance Requirements

A prospective student must satisfy, or be exempted from, the university entrance requirements specified by the Victorian Universities and Schools Examinations Board.

In exceptional circumstances consideration may be given to a person seeking entry to the University who has not passed the English expression paper in the higher school certificate examination but has obtained meritorious results in other subjects (including any prerequisite subjects specified for a School) in that examination. Enquiries should be directed to the Admissions Officer.

The current edition of the Board's handbook is available from the Secretary, Victorian Universities and Schools Examinations Board, 437 St Kilda Road, Melbourne, 3004.

In addition to the requirements specified in the handbook a prospective student seeking admission on the basis of the *mature age* provisions (that is not less than 30 years of age) must have passed English expression at the Victorian higher school certificate examination or a special test in English and two subjects at the Victorian higher school certificate examination in accordance with the requirements specified for admission to the particular school. Although the Schools of Social Sciences and Humanities do not have course prerequisites, it is suggested that an intending student choose higher school certificate subjects appropriate to those disciplines in which he will seek enrolment. It should be noted however that, in respect of the School of Social Sciences, a candidate is unlikely to gain selection if he has presented for two foreign languages, two science subjects or has included biblical studies or any of the music subjects.

Course Prerequisites – 1973

Prerequisite subjects must be at grade D or higher at the Victorian higher school certificate examination or an acceptable equivalent unless otherwise stated. There is no minimum age requirement at La Trobe.
Agriculture: Chemistry and either physics or a branch of mathematics. Exceptions may be made in special cases. Diplomates from Dookie and Longerenong agricultural colleges or Burnley Horticultural College will be considered for selection but should seek an interview with the Dean or an adviser of studies before applying.
Behavioural Sciences: There are no special course prerequisites for the Bachelor of Arts degree. Prerequisites for the Bachelor of Science degree

are chemistry and at least one subject out of: physics, biology and mathematics.

Biological Sciences: Chemistry and at least one subject out of: physics, biology and mathematics.

Education: Students are not admitted to first year. A student may enrol for education subjects either after completion of the first academic year in another school of the university or after the completion of a degree.

Humanities: There are no special course prerequisites.

Physical Sciences: *Either* two out of chemistry, physics, pure mathematics and applied mathematics; *or* general mathematics and either chemistry or physics. Exceptions might be made for students who obtain very high marks in the examination as a whole.

Social Sciences: There are no special course prerequisites.

How to Apply

Application forms (form A) have been distributed to all Victorian secondary schools presenting candidates for the higher school certificate examinations. Applications on form A close on 20 November 1972.

A prospective student who is not attending a Victorian secondary school may obtain the appropriate form (form B) from the Secretary, Victorian Universities Admissions Committee. Applications on form B close on 3 November 1972, unless the applicant is currently enrolled at a Victorian educational institution other than a secondary school, in which case the closing date will be 20 November 1972.

An application fee of $6 must be submitted with the form. All applications received at the Victorian Universities Admissions Committee office will be acknowledged by a card sent out in the middle of December. An applicant who has lodged an application by the date specified but has not received an acknowledgement by 20 December 1972 should direct an enquiry to the Victorian Universities Admissions Committee.

Admissions Advice

An applicant who seeks advice should contact in the first instance the Admissions Officer, Student Administration branch, La Trobe University (telephone 478 3122, extension 2738).

Acceptance of an Offer

Acceptance of an offer must be made promptly. When accepting the offer, a student is required to:

(a) discuss the proposed course with an adviser of studies,

(b) complete the registration forms prescribed for that year,
(c) pay part of the annual fees or produce evidence of a scholarship,
(d) have a photograph taken for a student card.

Complementary Course Enrolments

Where the School of Humanities allows a student to take a subject at the University of Melbourne concurrently with his enrolment at La Trobe University, this is known as a complementary course enrolment.

Students enrolling for complementary courses will normally be required to pay fees appropriate to La Trobe University and will be exempt from payment of other compulsory fees at the University of Melbourne.

Enquiries should be directed to the Admissions Officer.

UNDERGRADUATES – CONTINUING ENROLMENT

A student who wishes to continue in 1973 a course commenced in any School except Agriculture must seek an interview with an adviser of studies. Details of arrangements for interviews will be posted on the official notice board during October.

A student in the School of Agriculture is not required to attend an interview with an adviser of studies; however, the enrolment application should be forwarded through the office of the Dean by mail or personally if preferred.

Completion of the enrolment procedure requires:

(a) submission of the prescribed forms through the office of an adviser of studies, except in the case of the School of Agriculture (see above),
(b) payment of part of the annual fees or production of evidence of a scholarship not later than 9 March 1973,
(c) notification of a residential address for official correspondence by 9 March 1973,
(d) presentation of the student card to the Student Administration branch for updating.

An application for enrolment may be rejected if there are any outstanding debts, including fees, from the previous year of enrolment.

Withdrawal of Enrolment

A student may apply to withdraw an enrolment by completing a 'withdrawal of enrolment – 1973' form which is available from the advisers of studies or the Student Administration branch.

A withdrawal is not effective until the end of the week in which the form, together with the student card, is received at the Student Administration branch. Fees are assessed up to this time.

A withdrawal will be recorded as a failure at the discretion of the chairman of examiners for that subject *if the department concerned has already offered the major part* (normally two thirds) of the content of the subject. A student may submit reasons in support of a request that a withdrawal in a subject be not counted as a failure.

POSTGRADUATES

Admission to a Course

Details of the application procedure and the appropriate forms are available from the Graduate Studies office.

An applicant who is accepted as a candidate will be advised of the registration procedure in the letter notifying the approval and terms of candidature.

Continuing Enrolment

A student who is expected to continue a candidature in 1973 will be sent enrolment papers, by post, in December of 1972.

If a student expects to complete all the requirements specified in respect of his candidature before 30 March 1973 he need not re-enrol. The student should, however, advise the Graduate Studies office of the expected completion date.

RESIDENTIAL ADDRESS FOR OFFICIAL CORRESPONDENCE

The University requires a current residential address for official correspondence. An address such as C/- PO Box 12 is not acceptable; a non-resident student may not specify a college address or C/- a University department.

A change of this address must be submitted to the Student Administration branch on a 'change of address' form. A student must also submit his student card at this time so that the address on the jacket may be altered.

STUDENT CARD

Each student will be issued with a student card. The card is issued during the first year of enrolment and updated for each year that student enrols at the University.

It is part of the registration procedure for a photograph to be taken during the first year; the student card is a photographic by-product of this process. Failure to present this card, when requested, may cause inconvenience to the student concerned.

The card must be returned to the Student Administration branch for amendment if a student changes his address. If the card is lost, the loss should be reported to the Student Administration branch without delay. A new card may be obtained at a fee of $1. A damaged jacket will normally be replaced free of charge.

Without a current student card a student may not be permitted to use the University library or the Union.

OFFICIAL NOTICE BOARD

The official notice board is located on the second level of the South Building; it is in two sections outside the Student Administration branch.

Students are advised to inspect the official notice board at least once every week of each term.

Annual examination results (pass grades only) will be posted on the official notice board.

FEES

The scale of fees for 1973 and details of the fees procedure will be issued to each student as a separate booklet.

Refund of Fees

If a notice of withdrawal is received before the end of the first week of first, second or third term, any fees paid for that term will be refunded. However, a student enrolled in the University for the first time who withdraws before the end of the fourth week of *first* term may receive a refund of fees paid. A refund will not be made until the student card has been returned.

EXAMINATIONS

A student may present for the annual examination in any subject for which he has maintained an effective enrolment – i.e. registered, paid all fees – and where his progress during the year has been considered satisfactory.

A provisional examination timetable is published towards the end of second term to enable possible examination session clashes to be checked. The final examination timetable is available for collection from the Student Administration branch towards the end of September.

A student who considers that his performance in examinations has been or will be impaired by illness or other causes may seek special consideration by submitting the appropriate application together with appropriate medical evidence and other supporting statements. The forms are available from the Student Administration branch.

The pass grades adopted by the University for the final assessment of each undergraduate pass or honours subject are:

A	–	80 to 100
B	–	70 to 79
C	–	60 to 69
D	–	50 to 59
P	–	Ungraded pass
NC	–	Pass conceded

In certain cases, an aegrotat pass may be awarded. This is indicated by an asterisk immediately following the grade – eg. D*. Other grades are detailed on the memorandum of results.

Annual examination results (pass grades only) are posted on the official notice board.

The final assessment of honours-year work may be one of:

H1	–	First-class honours
2A	–	Second-class honours, division A
2B	–	Second-class honours, division B
H3	–	Third-class honours

The grades awarded for masters degrees are:

Master of Arts	First class honours
or	Second class honours
Master of Economics	Pass
Master of Education	
or	Pass
Master of Science	

CLASS TIMETABLES

A timetable for lectures and laboratory is produced towards the end of the preceding year. Continuing students should consult this timetable before selecting subjects for the current year. Amendments to the timetable are posted on the official notice board. Revised editions of the timetable are generally produced for second and third terms.

VARIATION OF 1973 COURSE

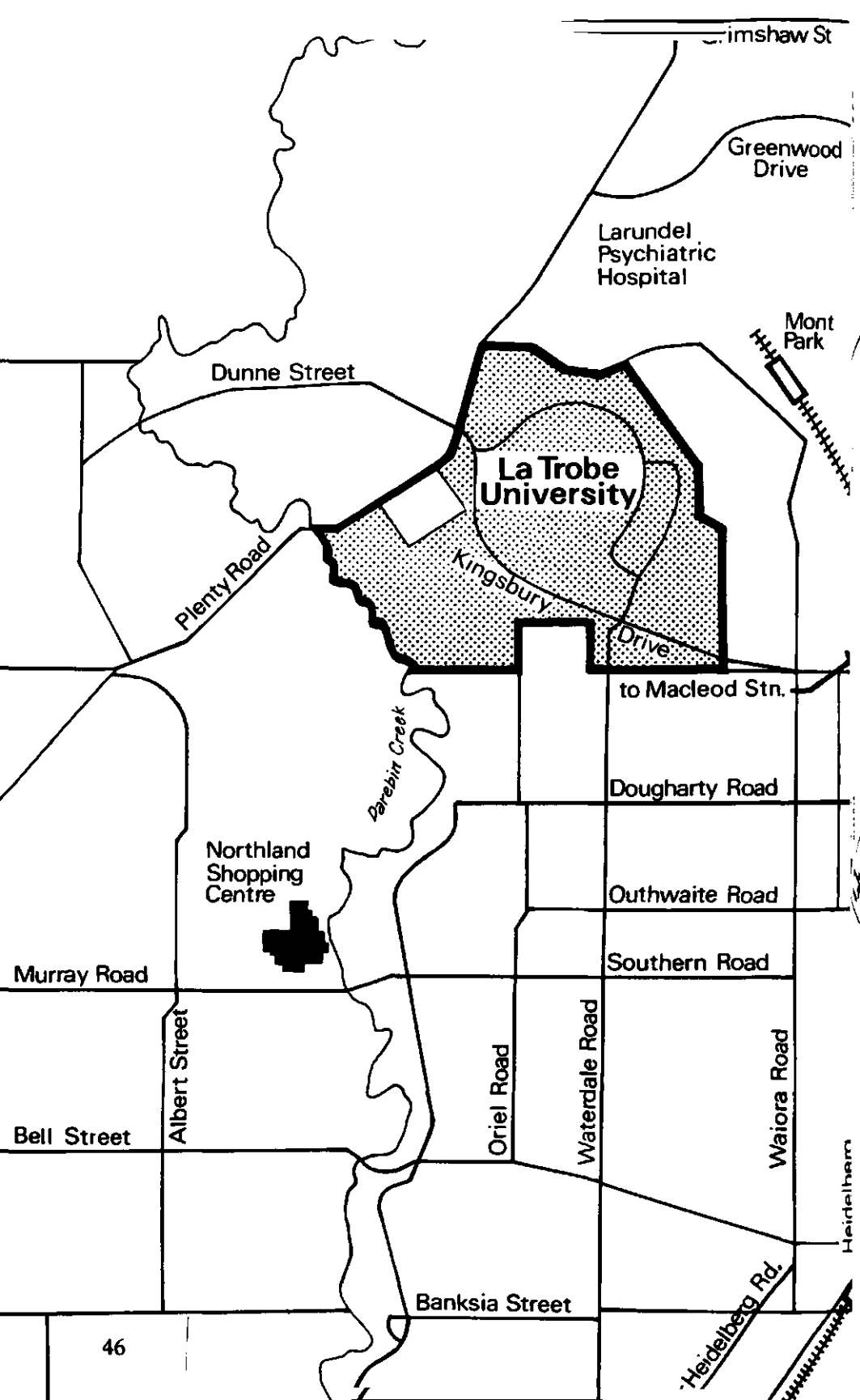
An accepted enrolment may be varied by the deletion of a subject (or subjects) and the inclusion of another subject or subjects, alteration of a course or a transfer from one School to another. A student may request permission to vary his enrolment up to 30 March. To do so he must complete a 'variation of a course – 1973' form. Copies of this form will be available from the adviser of studies. The completed form must be returned to an adviser of studies.

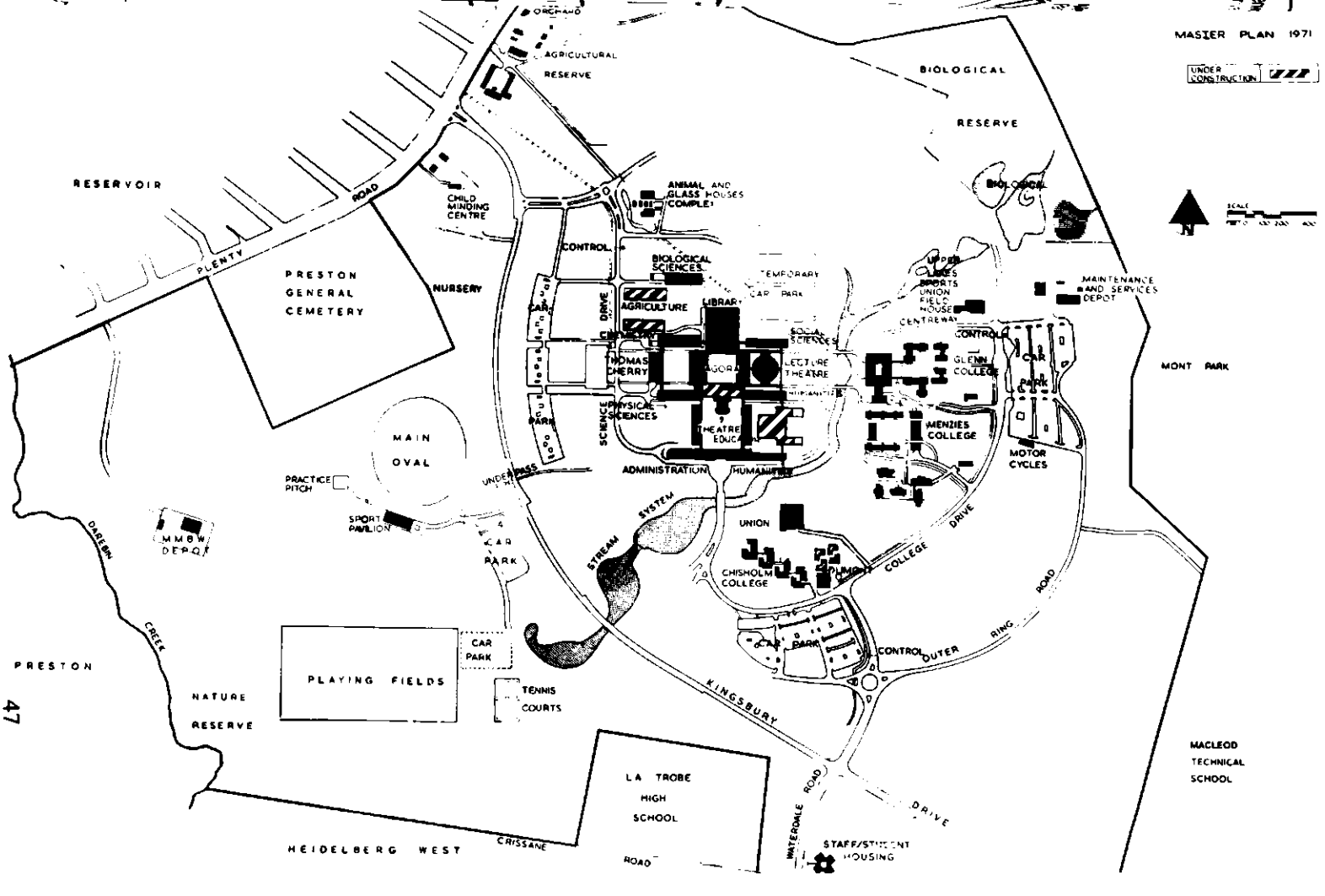
ARMORIAL BEARINGS

The official description of the University's armorial bearings is "For the Arms, Argent, a chaplet of common heath proper tied azure and circling in chief a Book expanded also proper leathered Gules, over all on a fesse of the last three Escallops Silver, and for the Crest on a Wreath Argent and Gules a Parchment Scroll perched thereon an Australian Wedgetailed Eagle, wings addorsed and inverted proper, the dexter claw supporting an Escallop of the Arms. The Mantling is Gules doubled Argent and the Motto – 'Qui cherche trouve' ".

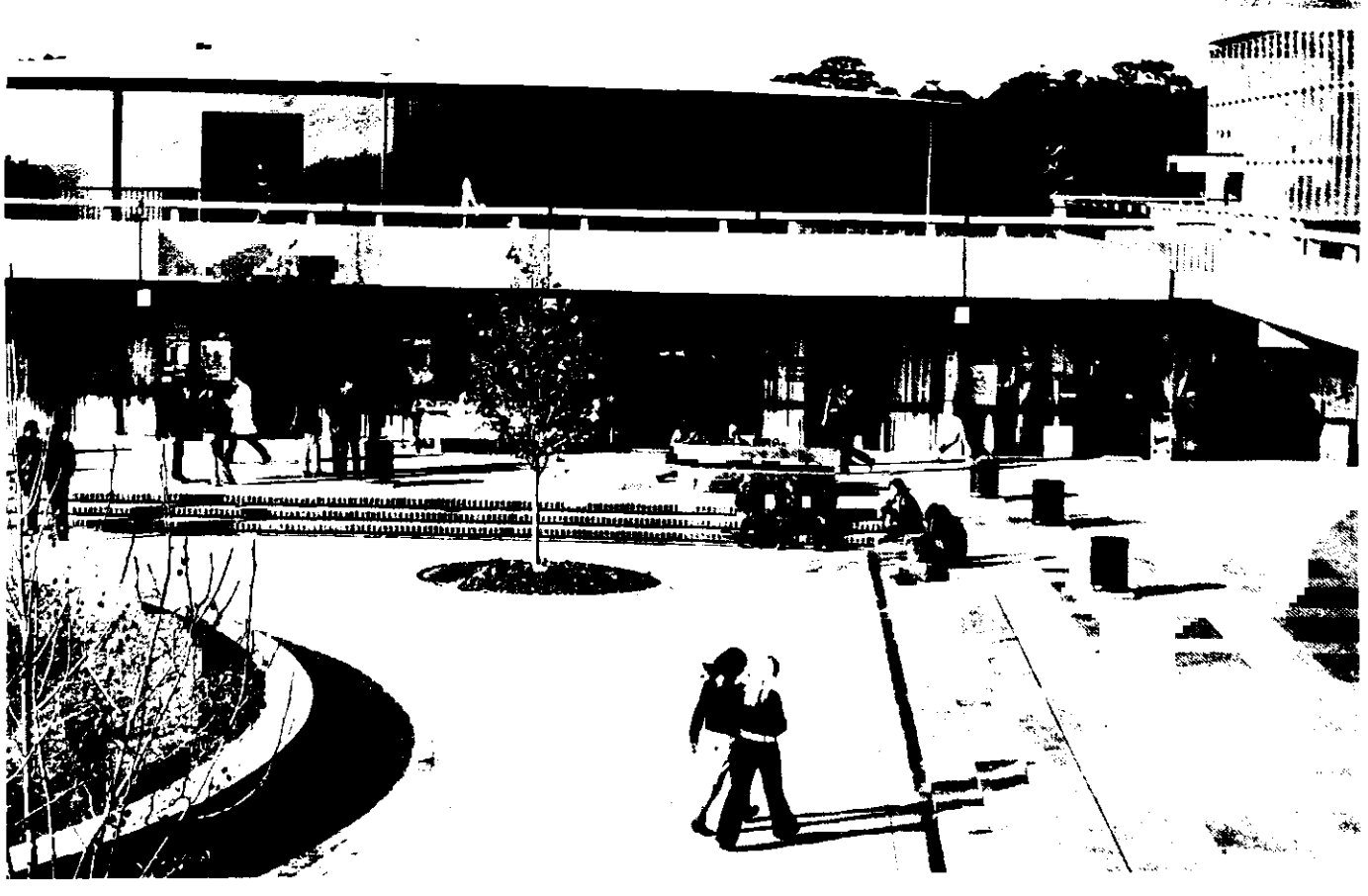
Australia is represented by the wedge-tailed eagle and Victoria by the sprigs of heath, the State's floral emblem. The open book symbolises learning and the scallop shells, which symbolise pilgrimages, are a reference to the armorial bearings of the La Trobe family.

The French motto "Qui cherche trouve" (He who seeks will find) is a modern version of the La Trobe family motto.

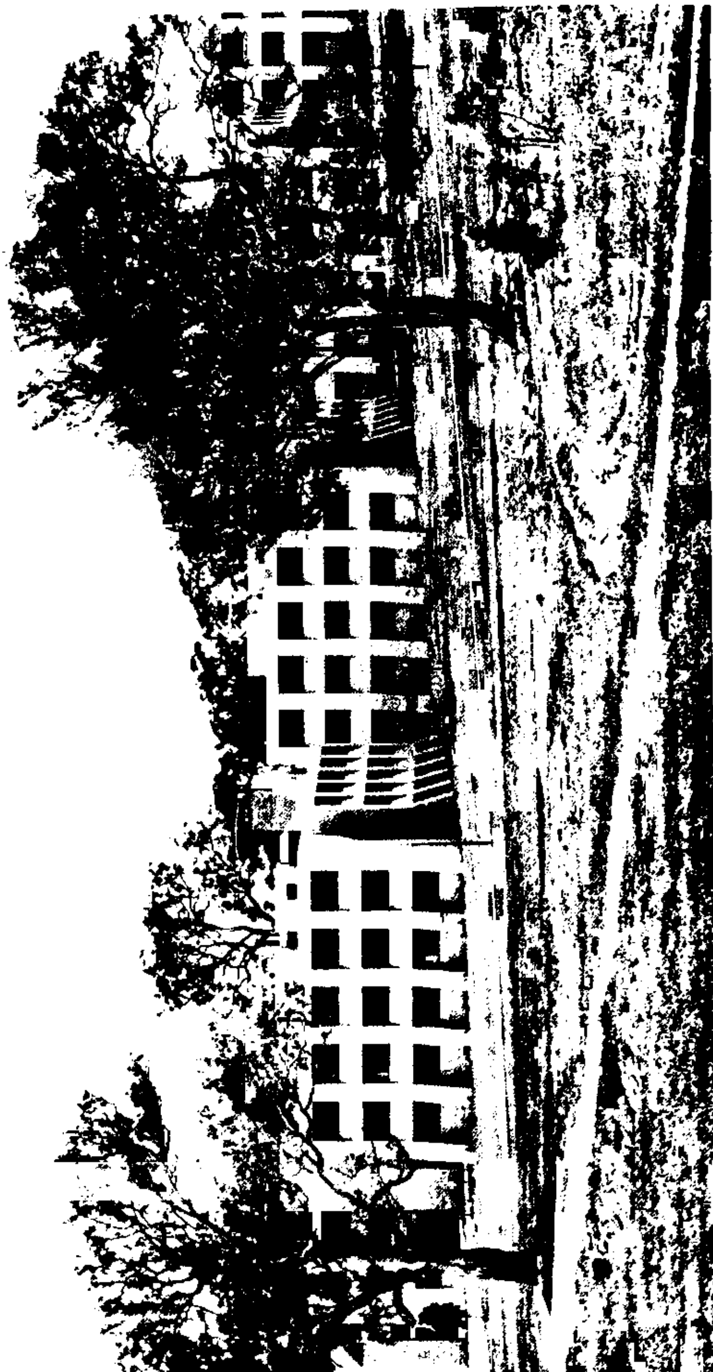

Greenwood Drive
Larundel Psychiatric Hospital
Mont Park
Dunne Street
La Trobe University
Kingsbury Drive
Plenty Road
to Macleod Stn.
Darebin Creek
Dougharty Road
Northland Shopping Centre
Outhwaite Road
Southern Road
Murray Road
Albert Street
Oriel Road
Waterdale Road
Waiora Road
Bell Street
Banksia Street
Heidelberg Rd.


MASTER PLAN 1971
UNDER CONSTRUCTION
ORCHARD
AGRICULTURAL RESERVE
BIOLOGICAL RESERVE
RESERVOIR
PLENTY ROAD
CHILD MINDING CENTRE
ANIMAL AND GLASS HOUSES COMPLEX
CONTROL
BIOLOGICAL SCIENCES
TEMPORARY CAR PARK
PRESTON GENERAL CEMETERY
NURSERY
CAR PARK
DRIVE
AGRICULTURE
LIBRARY
SOCIAL SCIENCES
LECTURE THEATRE
AGORA
HUMANITIES
THOMAS CHERRY
PHYSICAL SCIENCES
SCIENCE
THEATRE EDUCATION
ADMINISTRATION
UNDER PASS
MAIN OVAL
PRACTICE PITCH
SPORT PAVILION
MMBW DEPOT
DAREBIN CREEK
PRESTON NATURE RESERVE
PLAYING FIELDS
CAR PARK
TENNIS COURTS
STREAM
SYSTEM
UNION
CHISHOLM COLLEGE
CAR PARK
CONTROL
OUTER RING ROAD
KINGSBURY DRIVE
LA TROBE HIGH SCHOOL
CRISSANE ROAD
HEIDELBERG WEST
WATERDALE ROAD
STAFF/STUDENT HOUSING
UPPER LAWNS
SPORTS UNION FIELD HOUSE
CENTREWAY
MAINTENANCE AND SERVICES DEPOT
CONTROL
GLENN COLLEGE
CAR PARK
MENZIES COLLEGE
MOTOR CYCLES
MONT PARK
MACLEOD TECHNICAL SCHOOL
N
SCALE

Library



Biological reserve lakes



PART II: SCHOOL OF AGRICULTURE

GENERAL INFORMATION

Details of Courses

The course in agricultural science is designed to encourage in the student a basic understanding of the relations between the soil, the plant, the animal and the environment. It should be emphasized that the degree is in agricultural science, not in agriculture. Agriculture is not only an important component of our environment, it reacts with and affects the non-agricultural components. The emphasis in the course is therefore on the sciences relevant to an understanding of the rural environment. Substantial emphasis is also given to the study of economic and social aspects of agriculture and farm management.

The biology part of the course concentrates on the sciences which are concerned with soil productivity and plant and animal production. They include soil chemistry and physics, plant and animal nutrition, physiology and biochemistry, and plant and animal health. For these, the basic science courses (first and part of second year) are chemistry, mathematics, physics and biology. Production economics, farm-management economics, rural sociology and agricultural extension constitute one-third (or more, depending on the student's interest) of the third and fourth years of the course following an introduction to the subject in the second year.

The course leads to a B Agr Sc (pass or honours degree) at the end of four years. Honours graduates may then do postgraduate course work and research in a specific area of agricultural biology or in agricultural economics, leading to a M Agr Sc or Ph D degree. In the case of the M Agr Sc degree, the emphasis may be either towards further course work or towards research in the chosen area. Students intending to enter the teaching profession may begin study for the Diploma in Education in the third year, that is, they may study for the Dip Ed concurrently with their study in agricultural science, thus extending the course to five years.

Agricultural science graduates find employment in a wide variety of positions in State and Commonwealth government departments, as research workers or extension officers, in advisory and teaching services or in special areas such as conservation, agricultural economics and trade. Many have joined private firms which service the agricultural industries or process agricultural products, for example, chemical and food processing

companies and agricultural consultant and management groups. It can be expected that, as the Australian economy develops and agriculture adapts to the rapid changes now occurring, the opportunities open to graduates may also change. For example, there will be increasing emphasis on environment protection, conservation and land use in the coming years and agricultural scientists are well suited to undertake many tasks in these areas. Also private organizations may become larger employers of agricultural science graduates; at least 130 already employ such graduates in Australia.

Some 15 acres of the University campus is presently used by the School of Agriculture for field work involving crops, pastures and livestock. This gives students day to day contact with agricultural experimentation as well as with the more applied aspects of crop and animal husbandry.

All students are required to obtain at least 12 weeks' practical experience on approved farms for which no more than four weeks' credit can usually be gained on any one property. Students with a farming background and students holding a diploma from a recognized agricultural college may be granted exemption from part or all of this requirement. Under special circumstances, students may also be given credit for practical work in non-farm activities associated with agriculture.

It will be noted that text and reference books are not listed in this handbook. The School publishes a separate handbook which is issued to students on enrolment. It contains further information on text books and also more details of course content and requirements. This handbook is available to secondary schools on request.

Prerequisite for Admission

To have passed the higher school certificate examination in chemistry and in either physics or a branch of mathematics. Any prospective student who is unable to satisfy the prerequisites should write to the Registrar, giving full details of previous educational background, because requirements may be waived in special cases. Diplomas from approved agricultural colleges are accepted as satisfying the prerequisites, providing a pass in higher school certificate English expression has been obtained, but possession of a diploma does not give automatic entry to the School.

Quota and Selection

In view of the shortage of accommodation in relation to the demand for places, the number of students admitted is restricted. For those students seeking entry direct from the higher school certificate examination the

basis of selection is academic merit judged in the first instance by reference to their examination results. Other candidates may be required to attend for interview by the selection committee which will take into account all special circumstances. Such candidates who will be unable to attend for interview between 15 January and 9 February should write to the School as early as possible.

Academic Progress

Passes in each subject will normally be graded in four categories: A, B, C and D. A: 80 to 100 per cent. B: 70 to 79 per cent. C: 60 to 69 per cent. D: 50 to 59 per cent. Less than 50 per cent constitutes a failure.

Each year the academic progress committee of the School reviews the academic progress of students. A student whose progress has been considered unsatisfactory may be informed that should he again seek enrolment he will be required to show cause why such enrolment should be allowed. Alternatively he may be permitted to re-enrol but warned that subsequent failure to make satisfactory progress will mean automatic exclusion from the course.

A student will not be allowed to continue his enrolment if he is not making satisfactory progress. The final assessment of a student's progress may take into account his performance in tutorials, practical work, assignments and any other prescribed work.

A student will normally be required to pass all subjects of one year before proceeding to the next year or to achieve such a standard as to be awarded a pass in the year as a whole, under conditions laid down from time to time by the Board of Studies.

DETAILS OF SUBJECTS

First-Year Course

Agriculture I, Biology IA (botany and genetics), Chemistry I, and Physical Sciences IT (mathematics and physics). The curricula for subjects other than Agriculture I are set out under their appropriate subject headings in the disciplines section of this handbook.

Agriculture I is a course of 70 lectures, with one 3-hour practical class a week in two terms. Agricultural botany; the classification and identification of plants (weeds, grasses and legumes) important to agriculture. (Students are required to make a plant collection during the four years of the course; progress in this is assessed at the end of each year.) Introductory animal science, with particular reference to animal diversity, the

microstructure (histology) of animal tissues and the anatomical systems of the domestic animals. Principles of climatology, with particular reference to physical aspects; climate and vegetation, climate and pasture; chemical composition of pastures and seasonal changes, introductory animal nutrition; climate as a factor in agricultural production and land use; agricultural industries of Australia.

Second-Year Course

The second year includes Agriculture IIA (animal physiology), Agriculture IIB (soil science), Biology II (plant anatomy and physiology, agricultural genetics – see under biology), Chemistry IIB (see under chemistry), and Agriculture IIC (economics). These subjects do not carry equal weightings; Chemistry IIB is greater and Agriculture IIC is less in content than the other three subjects.

Agriculture IIA is a course of about 50 lectures and 20 three-hour practical classes. The course is intended to provide an understanding of the principles of animal physiology, with emphasis on the interdependence between the different systems of the animal body, the exchanges that occur in the body, and the regulatory mechanisms that serve to maintain the constancy of the internal environment. Topics considered in detail include growth, reproduction, endocrinology and the physiology of digestion.

Agriculture IIB is a course of about 50 lectures and 15 three-hour practical classes, including field excursions. The course is intended to promote an understanding of the soil *as an environment* from which plants derive nutrients. The course includes: a description of the solid phases of soils and their formation; soil erosion; soil microbiology; and the chemistry of essential plant nutrients in relation to their availability to plants.

Agriculture IIC is a course of about 20 lectures and up to 10 tutorials. The course is intended to introduce the basic concepts and principles of economics and to demonstrate the relevance of these principles to decision-making in agriculture for the individual farm, for particular agricultural industries, and at the national and international levels.

Third-Year Course

Agriculture IIIA (animal sciences), Agriculture IIIB (soil-plant sciences) and Agriculture IIIC (economics, agricultural economics, computing and statistical methods) each account for one-third of the third year of the course.

Agriculture IIIA includes nutritional biochemistry and physiology, and

agricultural microbiology. *Biochemistry:* 40 lectures and 10 six-hour practical classes. Enzyme action; pathways of metabolism of carbohydrates, lipids, amino acids, proteins and nucleic acids; photosynthesis; regulation of metabolic processes; introduction to chemotherapy and the action of toxic compounds. *Physiology:* 40 lectures, practical classes and demonstrations. Food intake; chemistry, physiology and bacteriology of digestion and absorption in ruminants and non-ruminants; quantitative aspects of metabolism of carbohydrates, fats and proteins, hormonal control of metabolism; metabolism in undernourishment, pregnancy and lactation; energy requirements for maintenance, growth, fattening, pregnancy and lactation; protein, mineral and vitamin requirements. *Microbiology:* 20 lectures and 25 one-hour and three-hour practical classes: Bacteriology: bacterial form, structure, growth and spore formation; the micro-organism and its environment; classification and nomenclature; viruses; sterilization and disinfection; microbiology of special environments, e.g. milk and milk products.

Agriculture IIIB deals with plants and their chemical, nutritional and physical environments. It is currently presented in three segments. *Soil physics:* 30 lectures, practical classes and field work, dealing with the use of physical methods and techniques for the description and measurement of the soil physical environment, the relation between the physical environment and plant growth. *Plant and crop physiology:* 30 lectures and practical classes dealing with photosynthesis and transpiration of leaves, plants and crops as related to environmental factors; physiological basis of yield; optinum productivity; growth analysis; competition; structure, light relationships and photosynthesis of plant canopies; introduction to the simulation of plant growth. *Plant nutrition:* 30 lectures and practical classes dealing with crop germination and establishment; root development; the cell and cell membranes; nutrient uptake and transport; nutrient functions, deficiencies and toxicities; fertilizer use in relation to plant growth, animal health and pollution.

Agriculture IIIC has three components. *Microeconomics:* about 30 lectures and 10 tutorials in the first half of the year. Topics include the price mechanism; opportunity cost, demand and supply; the concept of elasticity; profit maximization and marginal concepts; pure competition, imperfect competition, monopoly and oligopoly; countervailing power; pricing behaviour; microeconomic policy. *Production economics:* about 30 lectures and 10 tutorials in the second half of the year. Planning under perfect knowledge: concept of production functions; law of diminishing returns;

marginality, marginal, average and total product; elasticity of production; factor-product relationships; factor-factor relationships; resource substitution; price ratios; resource combination; cost minimization; iso-cost curves; iso-product curves; resource allocation; joint products; by-products; competitive products. Planning under imperfect knowledge: concept of risk and uncertainty; basic probability theory; discounting; time and risk; planning under risk situations; planning under uncertain situations; minimizing income variations; resource allocation at the national policy level. *Statistical methods:* one lecture and one practical a week throughout the year. Populations; distributions and their properties; significance tests; linear regression; correlation; analysis of variance; experimental design. Introductory computer programming: Fortran IV.

Fourth-Year Course

Students are given considerable freedom of choice, subject to availability of staff and facilities, in selecting areas of study, and in the relative emphasis given to the basic and applied aspects of these areas. Formal contact hours (lectures and practical classes) are the minimum necessary to complete the basic requirements of the course (see below); at least half the year's work is done by the student on his own initiative, following his own interests.

As in third year, there are three subjects: Agriculture IVA (animal sciences), Agriculture IVB (soil-plant sciences) and Agriculture IVC (agricultural economics, farm management, rural sociology and agricultural extension). The student can largely decide the emphasis given to each subject, but must comply with certain minimum requirements in each. Applications to take units of subjects offered in other Schools will also be considered.

The basic (minimum) courses are as follows:

Agriculture IVA: A two-term course of lectures plus practicals. Part of the course is devoted to *Parasitology* – life histories of parasitic arthropods and helminths; epidemiology and current methods of parasitic disease control; *Infectious diseases* – the nature of and the factors which determine the onset of infectious disease; mode of transmission with examples of endemic and exotic diseases; quarantine; *Immunology* – natural resistance and acquired immunity; antigenic determinants and antibodies, vaccination and hypersensitivity, serology. The rest of the course consists of lectures and discussions on selected topics of special importance in animal husbandry.

Agriculture IVB: A two-term course of lectures plus practicals. Part of the course is devoted to *Entomology* – a brief synopsis of insect classification; feeding habits and types of damage; insect and mite pests of agricultural importance with special reference to Australia; chemical, biological, cultural and other control methods; integrated control and pest management; *Plant pathology* – an introductory course to applied mycology, virology and nematology. The rest of the course consists of lectures and discussions on selected topics of special importance in the plant-soil science fields.

Agriculture IVC: The course has two components, *Sociology and extension* – 12 lectures in second term. Communication; perception; empathy; meaning; organizations; filtration and overload; spreading new ideas in rural areas; the importance of opinion leaders; motivation; getting ideas into practice; a theory of social action. *Agricultural economics and business management* – three lectures a week in first and second terms plus assignments and topics. The estimation of response surfaces; functional forms for production functions; the role and functions of management; farm business analysis, budgets, gross margins and programming methods for farm planning; farm planning under risk; long-run farm planning; systems analysis in agricultural management; agricultural marketing; agricultural prices; organization in agriculture; government intervention and agricultural policy; farm finance; evaluation of public investment in agriculture; technical change.

Excursions

Some excursions are an essential part of certain subjects, and are therefore compulsory; others are optional. Compulsory excursions are normally paid for by the School; the costs of optional excursions must be met by the student.

Half-day and full-day excursions form part of the second, third and fourth years. The major optional excursion will be in the last week of the August vacation in fourth year and may cost from $25 to $50. Full or half-day excursions on free days or free afternoons during term may be arranged, as opportunity offers, in all years and may cost about $1 each.

PART III: SCHOOLS OF BIOLOGICAL AND PHYSICAL SCIENCES

SCHOOL OF BIOLOGICAL SCIENCES

Four disciplines are offered in the School of Biological Sciences: biochemistry, botany, genetics and zoology.

The prerequisites for the School of Biological Sciences are passes in the higher school certificate examination in chemistry and one of physics, biology or a branch of mathematics.

The details of the course structure for this School are found under the heading of the degree of Bachelor of Science in the Schools of Biological Sciences and Physical Sciences. With the approval of the School the student may choose from a wide range of combinations of subjects from biological and physical sciences. Agriculture I offered by the School of Agriculture may also be chosen subject to approval of the School.

SCHOOL OF PHYSICAL SCIENCES

The prerequisites for the School of Physical Sciences are passes in the higher school certificate examination in one of the following combinations of subjects: (a) any two of chemistry, physics, pure mathematics, applied mathematics; (b) general mathematics and either chemistry or physics.

Four disciplines are offered in the School of Physical Sciences: chemistry, geology, mathematics and physics.

In the first year a student is required to take four units. One of these may be a first-year course offered by the School of Biological Sciences and one may be a subject from the School of Humanities or the School of Social Sciences. Students enrolled in the School who wish to take a unit in mathematics are required to take Mathematics IA. Mathematics IC is available only to students enrolled in other Schools.

At the second-year level where three units are required, a student may offer one unit from the School of Biological Sciences or one in philosophy. One unit of biology or philosophy may also be offered at third-year level.

The School of Physical Sciences, in conjunction with the Department of Economics, also offers a course leading to a B Sc degree in which economics can be taken with science subjects. The course consists of nine-and-one-half units, four in the first year, three-and-one-half in the second and two in the third year. Students interested in this course should discuss details with an adviser of studies of the School of Physical Sciences.

DEGREE OF BACHELOR OF SCIENCE IN THE SCHOOLS OF BIOLOGICAL AND PHYSICAL SCIENCES

A person is required to enrol for the pass-degree course in either the School of Biological Sciences or the School of Physical Sciences. With the approval of the appropriate Board of Studies a student may change Schools after the first year or after the second year.

The pass degree will consist of subjects which have a total work value of nine units, including one each year from the main discipline and should be taken over a period of not less than three years.

An honours degree will be awarded on the basis of a fourth year of study upon completion of the pass-degree course. A pass in a science language may be a requirement for an honours degree, but not for the pass degree.

A student who has been awarded either the Bachelor of Economics or the Bachelor of Arts degree may complete the Bachelor of Science degree by undertaking such additional subjects as the School may approve equivalent to a further two years of full-time work.

Completion of a subject includes attendance at such lectures and tutorial classes as prescribed as well as completion of such exercises and laboratory work as shall satisfy the discipline concerned. If a student has not complied with the prescribed requirements, he may be refused admission to the annual examination in that subject. Reasonable notice of the prescribed requirements will be given.

At the beginning of each year, a student shall obtain the approval of an adviser of studies of the School for his proposed selection of subjects to be completed in that year.

No student may: (a) take subjects which have a total work value of more than four units in the first year; (b) take a second-year level subject until he has completed first-year subjects with a total work value of three units, except with the permission of the School.

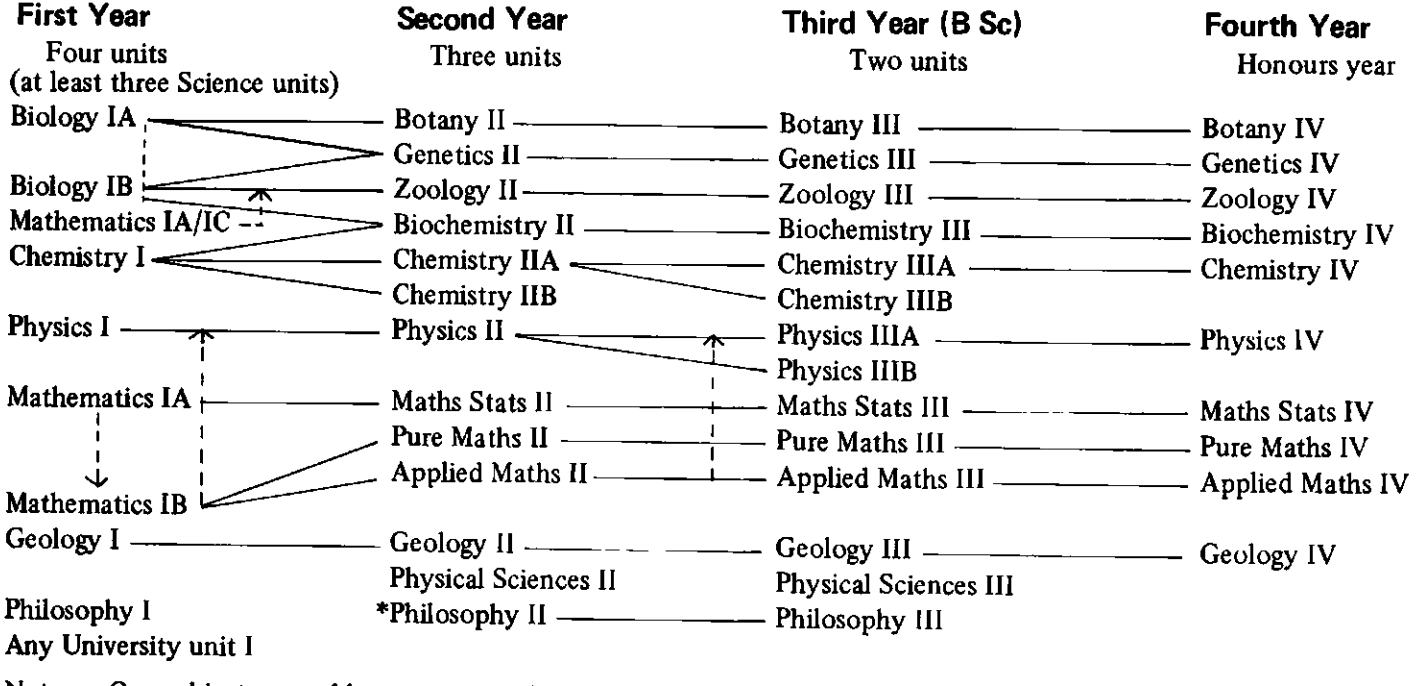
Except with the approval of the School, a candidate shall complete all subjects within a period of six years from the beginning of the academic year in which he completes the first of such subjects.

Part-time enrolment in the sciences involving laboratory work will normally not be permitted.

First-Year Subjects

Four subjects to be taken from the following, each of which has a work value of one unit:

SUBJECT SEQUENCES



Note: One subject crossed by prerequisite line - - - - -
required for continuation of sequence

* Philosophy II – prerequisites are, Philosophy I *or* any University unit I

Biology IA, Biology IB, Chemistry I, Geology I, Mathematics IA and IB, Mathematics IC (cannot be taken in combination with Mathematics IA or Mathematics IB), Physics I, subjects with a total work value of one unit from the School of Humanities or the School of Social Sciences or the Department of Psychology. (Social Sciences IA-IB and Social Sciences IA-IC are not acceptable for this purpose). Disciplines available in the Schools of Humanities and Social Sciences are economics, English, French, history, legal studies, philosophy, politics, sociology and Spanish.

To complete his first year a student shall: (a) pass in subjects which have a total work value of four units *or* (b) be passed by the School in the year as a whole.

Normally, all students in the School of Biological Sciences must take Biology IA and IB. Students in the School of Physical Sciences can take either Biology IA or Biology IB but not both.

Students taking the combined science/economics course can choose three units from the physical sciences subjects with Economics I.

Second-Year Subjects

Subjects which have a total work value of three units to be taken from Applied Mathematics II, Biochemistry II, Botany II, Chemistry IIA, Chemistry IIB, Genetics II, Geology II, Mathematical Statistics II, Philosophy IIFA, Philosophy IIFB, Philosophy IIPM, Philosophy IISA, Physics II, Pure Mathematics II, Physical Sciences II or Zoology II.

Only two of the philosophy subjects may be taken (all are half units). Chemistry IIA and IIB cannot be taken in combination. Students from the School of Biological Sciences must take at least two from Biochemistry II, Botany II, Genetics II and Zoology II.

Students taking the combined science/economics course can choose two units from the physical sciences subjects with one-and-one-half economics units.

Details of individual subjects are given in the section on the discipline concerned. A table showing the prerequisites and work value for each unit appears elsewhere in this handbook.

Third-Year Subjects

Subjects which have a total work value of two units to be taken from: Applied Mathematics III, Biochemistry III, Botany III, Chemical Physics III, Chemistry IIIA, Chemistry IIIB, Genetics III, Mathematical Statistics III, Philosophy IIIFA, Philosophy IIIFB, Philosophy IIILA, Philosophy III

LB, Philosophy IIIPM, Philosophy IIISB, Philosophy IIISA, Philosophy IIIFC, Physics IIIA, Physics IIIB, Pure Mathematics III, Physical Sciences III or Zoology III.

Chemistry IIIA and IIIB cannot be taken in combination. Any three of the listed philosophy subjects may be taken (providing they have not already been taken at second year) to form a third-year science unit.

Students taking the combined science/economics course can choose one unit from physical sciences with one economics unit.

Details of individual subjects are given in the section on the discipline concerned. A table showing the prerequisites and work value for each unit appears elsewhere in this handbook.

Honours Degree

Entry to the fourth year will be limited to those who have reached a satisfactory standard in the course for the pass degree. Graduates from other universties may also be admitted in special circumstances. To qualify for the honours degree, students should enrol on a full-time basis. Successful students will be awarded first-class, second-class (upper division), second-class (lower division), or third-class honours.

It is intended to allow specialization in a range of studies reflecting the academic interests of the Schools. The School of Physical Sciences will offer fourth-year courses in chemistry, geology, mathematics, and physics and one of an interdisciplinary nature. The School of Biological Sciences offers honours courses in biochemistry, botany, genetics and zoology. Entry to an honours-degree course in the School of Biological Sciences will be at the discretion of the chairman of the department concerned and will be decided on the results obtained in the pass-degree course taken in the School or elsewhere.

ACADEMIC PROGRESS

The results of a student who completes a pass or honours subject will be graded in four categories: A, B, C and D. A :80 to 100 per cent. B: 70 to 79 per cent. C: 60 to 69 per cent. D: 50 to 59 per cent. Less than 50 per cent constitutes a failure.

Each year the academic progress committees of the Schools review the academic progress of students. A student whose progress has been considered unsatisfactory may be informed that should he again seek enrolment in a course or in a subject he will be required to show cause why such enrolment should be allowed. Alternatively he may be permitted to re-

enrol but warned that subsequent failure to make satisfactory progress will mean automatic exclusion from that course or from that subject.

A student will not be allowed to continue his enrolment in any subject in which he is not making satisfactory progress. The final assessment of a student's progress may take into account his performance in tutorials, practical work, assignments and any other prescribed work.

A student who fails to meet the requirements established by each School may be considered not to have made satisfactory academic progress. In attempting to meet these requirements, a student will not normally be permitted to enrol for any subject more than twice.

A full-time student will normally be expected to obtain a work value of at least two units at the end of the annual examinations in his first year, at least four units within two calendar years, and at least seven units within four calendar years. A full-time student will be expected to complete the requirements for his degree within six calendar years of his first effective enrolment. A student having more than one unit outstanding shall not normally proceed to the next year's course.

The minimum rate of progress for a part-time student will be determined by the Board of Studies in each individual case.

GRADUATE STUDIES

Graduates may apply at any time to be admitted as candidates for the degrees of Master of Science, or Doctor of Philosophy. An appropriate honours degree will normally be the preliminary requirement for admission to any postgraduate-degree course. In some disciplines it may be possible to complete the work for the master's degree by thesis, by course work or a combination of the two. In most disciplines it is possible to read for a master's degree on a part-time basis. Persons seeking enrolment for a higher-degree course should first contact the professor of the appropriate discipline to discuss their particular research interests, as consideration of an application for a higher-degree course will depend on the availability of facilities and suitable supervisors. The candidature of each prospective student must be approved by the appropriate higher-degree committee before the student can be admitted to the University.

Further information on the fields of research pursued appears under the appropriate discipline.

PART IV: DEPARTMENT OF PSYCHOLOGY

The Department of Psychology, which is to be a foundation department of a School of Behavioural Sciences soon to be established, will offer courses leading to the degrees of Bachelor of Arts and Bachelor of Science. In 1973, the department will offer Psychology I, which may be taken as a prerequisite for further sequences of courses or as a terminal course, and also a second-year course Psychology IIB. There will be a quota on the number of students permitted to enrol in Psychology I in 1973.

Students wishing to major is psychology should enrol in the School of Behavioural Sciences. Psychology I will also be available for students enrolled in the Schools of Biological Sciences, Humanities and Physical Sciences, either as a terminal course, or as part of a sequence of two or three units in psychology.

The course is designed to introduce the student to a study of selected areas of human and non-human psychology based on empirical studies and theoretical principles underlying the various fields of the discipline.

Bachelor of Science Degree

The prerequisites for students enrolling for the B Sc degree in the School of Behavioural Sciences are passes in the Victorian higher school certificate examination, or an approved equivalent, in chemistry and any one subject from physics, biology or a branch of mathematics. A major sequence in psychology for the B Sc degree in the School will consist of three units, Biology IB will be a prerequisite for entry into the second-year psychology courses.

Bachelor of Arts Degree

There are no prerequisites for students enrolling for the BA degree in the School of Behavioural Sciences, but students wishing to major in that School will be required to take three units in psychology and a biology subject (in 1972 this was Biology IB).

B Sc (Honours) and Higher Degrees

Students wishing to obtain the degree of B Sc (honours), M Sc or Ph D will be accepted by the Department of Psychology provided their previous academic record is of high standard. Prospective candidates should contact the chairman of the department for further information

Details of the psychology courses offered in 1973 are shown in the disciplines section of this handbook. Details of degree structures for the BA and B Sc degree will be available from the Psychology Department.

PART V: DISCIPLINES

The following pages contain details of the disciplines in which subjects are offered. The disciplines are listed in alphabetical order. Information on examination requirements, lectures and other work requirements and postgraduate studies are included. Details of incompatible, companion and prerequisite subjects are set out in the table of subjects. Details of disciplines offered in the Schools of Education, Humanities and Social Sciences are included in a separate volume of the handbook.

AGRICULTURE

For details of agriculture subjects see the School of Agriculture entry in this volume of the handbook.

BIOCHEMISTRY

The Department of Biochemistry, in the School of Biological Sciences, offers courses which form part of the second and third year of the B Sc (pass) degree and may lead to a B Sc (honours) degree in biochemistry. Postgraduate training to the M Sc and Ph D levels is also available.

The courses available provide instruction in both theoretical and practical aspects of the subject and may be taken with other subjects offered by the School of Biological Sciences and with chemistry and psychology. It is thus possible to vary the course structure to obtain background experience suitable for different professional careers.

A sound biochemical training must be founded on a strong basis of chemistry as well as a good background in biological principles and techniques. It should be further supported by adequate mathematics and physics. The courses set out below incorporate these features.

First Year	Second Year	Third Year
Biology IA, Biology IB, Chemistry I, *and one of* Maths I, Physics I, Psychology I.	Biochemistry II *and two of* Botany II, Genetics II, Zoology II.	Biochemistry III *and one of* Botany III, Genetics III, Zoology III.
OR	OR	OR
Biology IA *or* IB Chemistry I, *and two of* Physics I, Maths I, Psychology I.	Biochemistry II, Chemistry II, *and one of* Botany II, Genetics II, Zoology II, Psychology II, Maths II.	Biochemistry III and Chemistry IIIB

Details of the courses offered by the Biochemistry Department are described below. Further information may be obtained from the chairman of the department.

BIOCHEMISTRY II

Syllabus: Protein structure and function; basic enzymology, polynucleotide structure/function/synthesis; protein synthesis; lipids and membranes, polysaccharide structure and synthesis. Digestion and absorption, carbohydrate and lipid metabolism, energetics and biological oxidations; nitrogen metabolism; metabolic control; nutritional biochemistry.

Prerequisites: 1. Chemistry I; 2. Biology IA or IB.

Class Requirements: A course of three lectures a week and an average of three hours practical work a week throughout the year in experiments concerning techniques in quantitative biochemistry.

Books: No textbook is prescribed but the following provide a good general coverage of the material in the syllabus.

White, A., Handler, P. and Smith, E.L. *Principles of Biochemistry* 4th edn, McGraw Hill 1968

Lehninger, A.L. *Biochemistry* International edn, Worth 1972

McIlvery, R.W. *Biochemistry – A Functional Approach* Saunders 1970

The following are recommended for reference in relation to specific sections of the course:

Cohen, G.N. *The Regulation of Cell Metabolism* Holt, Rinehart and Winston 1968

Rees, D.A. *The Shapes of Molecules* Oliver and Boyd 1967

Mahler, H.R. and Cordes, E.H. *Biological Chemistry* Harper 1966

Examinations: In addition to one 2-hour and two 3-hour written papers, to be given at the end of the course, written and practical tests may be given during the year. Performance in practical work will be taken into account in the final assessment.

BIOCHEMISTRY III

Syllabus: The chemistry, physico-chemistry and biochemistry of macromolecules of biological importance. The kinetics and mechanism of enzyme action. The biochemistry of cell membranes in relation to energy transformations and cellular transport phenomena. The integrated operation and functions of metabolic pathways for the metabolism of carbohydrates, lipids, amino acids, purines and pyrimidines. The regulation of metabolism at the cellular, tissue and whole organism levels. Cellular and tissue specificity in metabolism. Metabolism in selected nutritional and abnormal states. Developmental biochemistry – differentiation, ontogeny of enzymes, organogenesis. Biochemical evolution. Selected topics in the biochemistry of foods, drug metabolism and clinical biochemistry.

Prerequisite: Biochemistry II.

Class Requirements: A course of four lectures a week throughout the year and an average of 10 hours a week practical work or practice classes concerned with experimental methods and calculations in physical biochemistry, enzymology, metabolism, and the separation and analysis of biological molecules.

Prescribed Reading

Dawson, R.M.C., Elliot, J., Elliot, W.M. and Jones K.M. *Data for Bio-Chemical Research* 2nd edn, Oxford Univ. Pr. 1969

Recommended Reading

Foundations of Modern Biochemistry Series Prentice Hall, 1971

Barker, R. *Organic Chemistry of Biological Compounds*

Lamer, J. *Intermediary Metabolism and its Regulation*

Van Holde, K. *Physical Biochemistry*

Wold, F. *Macromolecules: Structure and Function*

Examinations: In addition to three 3-hour written examinations to be given at the end of the course, written and practical tests may be given throughout the year. Performance in practical work, experimental projects and written assignments will be taken into account in the final assessment.

HONOURS

A one-year honours course in biochemistry is available to graduates with a B Sc or with an equivalent qualification from other universities. The course will consist of a research project, together with some special lectures, seminars and a literature review.

POSTGRADUATE STUDY

Prospective M Sc and Ph D students should contact the chairman of the department.

BIOLOGY

Biology IA and IB will be available in the first year. These are courses in botany and zoology respectively, with a course on genetics and evolution common to both subjects. Unless given special permission to the contrary, students must pass both subjects to proceed to any second-year subject. Details of second-year and subsequent studies in the School of Biological Sciences can be found under the headings Biochemistry, Botany, Genetics and Zoology.

BIOLOGY IA (BOTANY AND GENETICS) AND BIOLOGY IB (ZOOLOGY AND GENETICS)

Prerequisites For 1973: For students enrolled in the School of Biological Sciences – a pass in chemistry and in any one subject from physics, biology or a branch of mathematics in the Victorian higher school certificate examination or an approved equivalent.

Botanical Component Biology IA (50 lectures)

This course is designed to introduce students to the major disciplines of botany and also to serve as a one-year terminal course for students enrolled in other Schools.

Syllabus: The following topics are covered:

1. Structure and physiology of higher plants including studies of the ultrastructure of plant cells (25 lectures).
2. A survey of the major groups of plants with emphasis on evolutionary considerations (15 lectures).
3. Studies of the relationship between plants and the environment – an introduction to the principles of plant ecology (10 lectures).

Prescribed Reading

Raven, P.H. and Curtis, H. *The Biology of Plants* Worth Publications Inc. 1970

Students are also advised to purchase a special course handbook produced by the Department.

Zoological Component Biology IB (50 lectures)

This course is a basis for those students wishing to proceed to the advanced zoology courses. Although it may serve as a one-year terminal course, it was not designed as such.

Syllabus: The diversity of structure and function in the main groups of animals will be studied from an evolutionary point of view. Introductions to the physiology of mammals, and to animal ecology, behaviour, embryology and reproduction will also be presented.

Prescribed Reading

Weiz, P.B. *The Science of Zoology* McGraw-Hill

Genetical Component Biology IA and Biology IB (25 lectures)

The following course is common to Biology IA and IB: principles of genetics; introduction to population, quantitative and human genetics; genes and metabolism; the genetic code and protein synthesis; processes of organic evolution; the nature of human variation.

Prescribed Reading

Stebbins, G.L. *Processes of Organic Evolution* Prentice Hall 2nd edn 1971

Genetics Notes by the Department of Genetics

Class Requirements: Lectures – three a week for three terms. Practical tutorial classes one 4-hour class a week for three terms; one excursion (Biology IB). The botanical and zoological components of Biology IA and IB will consist of 50 lectures with corresponding practical classes, and the genetical component will be a course common to both subjects consisting of 25 lectures with corresponding practical classes.

Special Requirements: Students are advised to attend all lectures and practical-tutorial classes offered, and to purchase necessary instruments. A list of such instruments will be made available by the School of Biological Sciences.

POSTGRADUATE STUDIES

Students wishing to obtain the degree of B Sc (Hons), M Sc or Ph D will be accepted into the four departments of the School provided that their previous academic record is of high standard. Prospective candidates should contact the chairman of the appropriate department for further information.

BIOLOGY II

This is a special course for students enrolled in the School of Agriculture and consists of a selected portion of the Botany II course together with a special course in agricultural genetics given by the Genetics Department.

The botanical component will deal with the anatomy and physiology of vascular plants with emphasis on plant growth and development, tissue differentiation and the control of various aspects of growth by growth-regulating substances.

The genetics component will comprise various topics of specific interest to agricultural scientists, viz. genotype-environment interactions, genetic analysis of quantitative characters, selection theory, selection techniques in plants and animals, cytogenetic techniques in plant breeding, biochemical and behavioural genetics of domestic animals.

BOTANY

BOTANY II (75 lectures)

Syllabus

1. Anatomy and physiology of vascular plants with emphasis on plant growth and development, tissue differentiation and the control of various aspects of growth by growth-regulating substances (24 lectures).
2. The ecology of terrestrial plants with emphasis on their life cycles in relation to the environment and the effect of environmental and biotic factors on the distribution of individual plant species. An introduction to angiosperm taxonomy (16 lectures).
3. Aspects of the biology of fungi including soil microbiology and plant pathology (12 lectures).
4. Physicochemical aspects of the water and solute relations of plant cells (13 lectures).

5. The biology of ferns (10 lectures).

Prerequisites: 1. Biology IA. 2. At least one of the following: Chemistry I, Physics I, or a branch of first-year mathematics.

Class Requirements: Lectures – three hours a week for three terms. Practical/tutorial classes – two 3-hour classes a week for three terms. A field trip of approximately four days in the first or second term vacation will be an essential part of the practical course and reports based on it will be used in the final course assessment. It will not be possible to set alternative work.

Prescribed Reading

Botany II and Biology II

Leopold, A.C. *Plant Growth and Development* McGraw-Hill 1964

Edelman, J. and Black, M. *Plant Growth* Heinemann 1970

Esau, K. *Plant Anatomy* 2nd edn, J. Wiley and Sons Inc. 1965

Botany II

Cutter, E.G. *Plant Anatomy: Experiment and Interpretation* Part I 'Cells and Tissues' Edward Arnold, London 1969

Deverall, B.J. *Fungal Parasitism* (Studies in Biology No. 17) Edward Arnold, London 1969

Alexopoulos, C.J. *Introductory Mycology* 2nd edn J. Wiley and Sons Inc. 1962

Briggs, G.E., Hope, A.B. and Robertson, R.N. *Electrolytes and Plant Cells* Blackwells, London 1961

Price, C.A. *Molecular Approaches to Plant Physiology* McGraw-Hill 1970

Salisbury, F.B. and Ross, C. *Plant Physiology* Wadsworth Pub. Co. Inc., 1969

Optional

Sporne, K.R. *The Morphology of the Pteridophytes* 2nd edn Hutchinson University Library, 1966

Willis, J.H. *Ferns, Conifers and Monocotyledons* (A Handbook to Plants in Victoria, Vol. 1) 2nd edn Melbourne Univ. 1970

Wakefield, N.A. *Ferns of Victoria and Tasmania* Field Naturalists Club of Victoria 1955

Slatyer, R.O. *Plant-Water Relationships* Academic Press, London and New York, 1967

Harre, R. *The Method of Science* Wykeham Publications, London 1970

Daubenmire, R. *Plant and Environment* Wiley, New York 1959

BOTANY III (100 lectures)

Syllabus

1. Aspects of the physiology and biochemistry of plants. Cellular bioenergetics, enzymology and substrate specificity; intermediary metabolism of carbohydrates and lipids in plants; sulphate and nitrate reduction; photosynthesis and the biosynthesis of various plant products; regulation of protein synthesis and the control of metabolism (20 lectures).
2. Plant ecology, including studies of plant succession, vegetation dynamics and plant palaeogeography (8 lectures).
3. Aspects of plant cell physiology. Membrane phenomena and the movement of water and solutes. Bioenergetics (18 lectures).
4. Studies on selected fungal plant pathogens and the relation of their ultrastructure to fungal metabolism. An introduction to the factors affecting host penetration and analysis of disease 'resistance' in plants with special emphasis on dynamic defence mechanisms initiated after infection. The role of enzymes in pathogenesis and a study of the concept of toxins, growth regulating, and high molecular weight substances involved in symptom expression in the vascular wilts (14 lectures).
5. The ultrastructure and function of plant cells. A survey of current views of the structure of cell membranes, the structure of cellular organelles and their ontogeny, interrelation and continuity, as well as a discussion of selected topics relating to the evolution of cellular organelles and cytological aspects of cell differentiation (14 lectures).
6. Detailed morphological survey of the families and genera of gymnosperms, their geographic distribution, evolution, reproduction and embryogeny. The treatment of angiosperm morphology will emphasize modes of reproduction – asexual and sexual. Special attention is paid to floral types, inflorescence types, fruits, seeds, embryo sacs and pollen types as well as to the processes of gametogenesis, embryogeny, polyembryony, parthenocarpy, parthenogenesis and apomixis. Evolutionary trends and differences between these two major groups will then be evaluated (14 lectures).
7. Aspects of the biology of algae. The nutrition of algae including photosynthesis, nitrogen and sulphur metabolism, heterotrophic nutrition. The growth of algae in culture. Ultrastructure and physiology of algae. Selected aspects of the ecology of marine and freshwater algae (12 lectures).

Prerequisite: Botany II

Class Requirements: Lectures – four a week for three terms. Practical/tutorial classes – three 3-hour classes a week. A field trip of approximately four days will be part of the practical work.

Prescribed Reading

Foster, A.S. and Gifford, E.M. Jr *The Comparative Morphology of Vascular Plants* Freeman and Co. 1959

Wood, R.K.S. *Physiological Plant Pathology* Blackwells, Oxford 1967

Slatyer, R.O. *Plant-Water Relationships* Academic Press, London and New York 1967

Lehninger, A. *Biochemistry* Worth Pub. Co. 1970

Clowes, F.A.L. and Juniper, B.E. *Plant Cells* Blackwells, London 1962

Sporne, K.R. *The Morphology of Gymnosperms* Hutchinson University Library 1965

Kay, R.H. *Experimental Biology* Chapman and Hall, London 1966

Harre, R. *The Method of Science* Wykeham Publications, London 1970

Nobel, P.S. *Plant Cell Physiology* W.H. Freeman and Co., San Francisco 1970

Round, F.E. *The Biology of the Algae* Edward Arnold, London 1965

Conn, E.E. and Stimpf, P.K. *Outlines of Biochemistry* John Wiley and Sons Inc., Int. Student edn 1966

HONOURS

A one-year honours course in Botany is available to graduates from La Trobe or from other Universities provided that their previous academic record is of a high standard. The course consists of a research project, together with other prescribed work including essays and seminars.

POSTGRADUATE STUDIES

The department offers research programs leading to the degrees of M Sc or Ph D. Prospective candidates should consult the chairman of the department for further details.

Research is currently in progress in the following fields: the ultrastructure and anatomy of plants; aspects of the physiology, biochemistry and biophysics of plants; plant pathology; plant taxonomy and plant ecology.

CHEMICAL PHYSICS

An interdisciplinary course of study within the School of Physical Sciences, chemical physics offers a coherent program leading to the B Sc (pass) and B Sc (honours) degree.

The course is designed to provide a solid grounding in the field of chemical physics, and will serve either as a suitable training for teachers of physics or chemistry and for industrial appointments, or as an introduction to postgraduate research. In addition, the structure is such that there is more flexibility for branching towards either physics or chemistry than is otherwise possible.

Students wishing to follow this course should, in any year after the first, discuss their choice of physics, chemistry or mathematics components with the respective student advisers.

FIRST YEAR

Physics I, Chemistry I, Mathematics IA and Mathematics IB are the subject units required for the first year of the course. This combination also leads to any second-year subject other than geology offered in the School of Physical Sciences.

SECOND YEAR

Physics II, Physical Sciences II and Applied Mathematics II form the recommended course units for enrolment. Because of the requirements for Applied Mathematics III the suggested composition of Physical Sciences II is: Chemistry IIA, Physical (1/3 unit), Mathematics II, PM 201, PM 202, PM 203, AM 205 (2/3 unit).

This course is also suitable for students intending to major in pure physics. An alternative course which instead would also be suitable for students considering specializing in chemistry is Physics II, Chemistry IIA and Applied Mathematics II.

THIRD YEAR

Chemical Physics III is a composite two-unit course comprizing components from Physics IIIA, Chemistry IIIA (physical), and Applied Mathematics III. It is open to students who have passed in either of the preceding courses, but those with the latter alternative will probably have to modify the applied mathematics segment. The recommended components (with credit points in brackets) are:

Physics IIIA: Electromagnetic Theory (2), Nuclear Physics (2), Statistical Mechanics (2), Optics (1), Solid State (2), Laboratory (4).

Chemistry IIIA: Symmetry and bonding (2), Spectroscopy (2), Mass Spectrometry (1), Diffraction methods (1), Statistical Mechanics (1), Laboratory (3).

Applied Mathematics III: Methods (5), Dynamics (2) Quantum Mechanics (4), Numerical Analysis (2).

Students who do not have the necessary prerequisites for some of these applied mathematics components may substitute others from either physics chemistry, or in some instances Pure or Applied Mathematics II, provided the total of 36 credit points is maintained.

FOURTH YEAR

Flexibility is a feature of the honours-year course. Chemical Physics IV has a nucleus which is common for all enrolled, and the remaining components may be chosen according to the particular interests of each student. Each of the lecture courses and the research project carries the same value (in terms of percentage of the total years' mark) as they represent in the overall courses of their respective department or division, and should be chosen so that the total course value is as close as possible to 100 per cent. The common components are:

Physics IV: quantum mechanics, statistical mechanics, scattering theory.

Chemistry IV: molecular electronic structure, advanced spectroscopy, molecular dynamics.

POSTGRADUATE STUDIES

Research programs leading to the degrees of M Sc or Ph D are available to holders of a good honours degree in chemical physics. Candidates of equivalent standing in related subjects may also be admitted. The divisions within the School co-operating in such programs are those of electron physics, physical chemistry, space physics, and in some instances applied mathematics. Degree requirements are similar to those existing in other areas of the School.

CHEMISTRY

The three Departments of Chemistry combine to offer courses leading to the B Sc (pass) and B Sc (honours) degrees. In the academic year 1973, Chemistry I, Chemistry IIA and IIB, Chemistry IIIA and IIIB and Chemistry IV will be available.

Courses are intended to provide a thorough and balanced training in chemistry which will serve as a satisfactory prelude either to postgraduate research, further courses in allied subjects, industrial appointments, or a career in teaching, and are organized so that a student may major solely in chemistry; jointly in chemistry and another discipline from the School of Physical Sciences; or in chemistry and either biochemistry, botany, economics, genetics, philosophy or zoology.

Students intending to proceed to the honours degree in chemistry will be selected on the basis of their performance in the pass-degree course.

CHEMISTRY I

Prerequisites: A student will normally be expected to have obtained a pass in chemistry at the higher school certificate examination or an approved equivalent, and to have reached at least leaving standard in physics and mathematics.

Inorganic and Analytical Chemistry

Syllabus: Chemistry of the more important metallic and non-metallic elements with particular reference to the periodic classification of elements; the electronic structure of atoms; the principles of valency theory and chemical bonding; introduction to the chemistry of coordination compounds, valence bond, crystal and ligand field theories; analytical chemistry; nuclear and radiochemistry.

Prescribed Books

Basolo, F., and Johnson, R.C. *Coordination Chemistry* Benjamin 1964

Companion, A.L. *Chemical Bonding* McGraw-Hill 1964

MacKay, K.M., and MacKay, R.A. *Introduction to Modern Inorganic Chemistry* revised edn Intertext Books 1972

(This book is prescribed for Chemistry II courses also, and should be purchased by students proceeding to Chemistry II.)

Recommended Books

Gelb, I.R. *Elementary Quantitative Chemistry* Harper and Row 1970

Brescia, F., Arents, J., Meislech, H., and Turk, A. *Fundamentals of Chemistry* Academic Press 1970

Heslop, R.B., and Wild, G.M. *S.I. Units in Chemistry: An Introduction* Applied Science 1971

Christian, G.D. *Analytical Chemistry* Xerox 1971

Newton, G.W.A., and Robinson, V.J. *Principles of Radiochemistry* Macmillan 1971

Organic Chemistry

Syllabus: Elementary organic chemistry, with particular reference to electronic theory and reaction mechanism; isomerism and stereochemistry; preparation and reaction of aliphatic and aromatic hydrocarbons, alcohols, halides, ethers, aldehydes, ketones, carboxylic acids and derivatives and amines.

Prescribed Book

Davis, M., Deady, L.W. and Topsom, R.D. *Introductory Organic Chemistry* Longmans 1973

Physical Chemistry

Syllabus: The physical chemistry of gases, liquids, solids and plasma; properties of dilute solutions, ionic solutions including acids and bases; phase equilibria; chemical equilibria; thermodynamics; reaction kinetics.

Prescribed Book

Dickerson, R.E., Gray, H.B. and Haight, G.P. *Chemical Principles* W.A. Benjamin 1970

Recommended Book

Aylward, G.H. and Findlay, T.J.V., *SI Chemical Data,* Wiley 1971

Practical: The course includes the preparation and reactions of inorganic compounds; the preparation, purification, properties and reactions of typical organic compounds, and experiments related to the physical chemistry lecture course.

A molecular model kit will also be required for the three branches of chemistry. Further details will be available from the Departments of Chemistry.

Class Requirements: Lectures – three a week for three terms. Tutorials and problem classes – as arranged. Practical – one 3-hour period a week throughout the three terms.

Examinations: Theory – three 1½-hour written papers. Tests on theoretical background to the practical course and the theory will be held throughout the year as required.

The performance of each student in the practical laboratory courses is assessed throughout the year and taken into account in determining the success of the student at the annual examinations.

CHEMISTRY IIA

Prerequisites: Chemistry I; and Physics I or a first-year mathematics unit. This course is intended for the student wishing to major in chemistry, and proceeding to the honours degree in chemistry, or those intending to specialize in physics, physics and chemistry, or chemistry and philosophy, jointly. The course is also suitable for students enrolled in the School of Biological Sciences.

Inorganic and Analytical Chemistry

Syllabus: General and inorganic chemistry of the non-metallic elements; reactions in non-aqueous solvents; introduction to the inorganic solid state; hydrides of Groups V and VI; nuclear and radiochemistry; instrumental analysis.

Prescribed Books

MacKay, K.M., and MacKay, R.A. *Introduction to Modern Inorganic Chemistry* revised edn Intertext 1972

Demitras, G.C., Russ, C.R., Salmon, J.F., Weber, J.H., Weiss, G.S. *Inorganic Chemistry* Prentice-Hall 1972

(For students proceeding to Chemistry III)

Recommended Books

Gould, E.S. *Inorganic Reactions and Structure* revised edn, Holt, Rinehart and Winston 1962

Duncan, J.F., and Cook, G.B. *Isotopes in Chemistry* Clarendon Press 1968

Ewing, G.W. *Instrumental Methods of Chemical Analysis* McGraw-Hill 3rd edn 1969

Cotton, F.A., and Wilkinson, G. *Advanced Inorganic Chemistry* 3rd edn, Interscience 1966

Organic Chemistry

Syllabus: Physical organic chemistry; investigation of reaction mechanisms; aromatic substitution reactions; reaction intermediates; carbohydrates, amino acids, proteins, lipids; simple conformational analysis and optical activity.

Prescribed Book

Hendrickson, J.B., Cram, D.J. and Hammond, G.S. *Organic Chemistry* 3rd edn, McGraw-Hill, Int. Student Edn

Recommended Book

Gould, E.S. *Mechanism and Structure in Organic Chemistry* Holt, Rinehart and Winston 1959

Physical Chemistry

Syllabus: PC2.01 Theoretical Molecular Structure, PC2.02 Experimental Molecular Structure, PC2.03 Thermodynamics and Solutions, PC2.04 Reaction Kinetics. Students enrolled in the School of Biological Sciences may substitute PC2.05 Macromolecules, Colloids and Surface Chemistry in place of PC2.01.

Prescribed Book

Daniels, F., and Alberty, R.A., *Physical Chemistry* 3rd edn, John Wiley 1967

Recommended Books

Aylward, G.H. and Findlay, T.J.V., *SI Chemical Data* Wiley 1971

Barrow, G.M., *Physical Chemistry* 2nd edn, Mc Graw-Hill 1966

Moore, W.J., *Physical Chemistry* 3rd edn, Prentice-Hall 1962

Barrett, J., *Introduction to Atomic and Molecular Structure* John Wiley London 1970

Gray, H.B., *Electrons and Chemical Bonding* Benjamin 1965

Barrow, G.M., *The Structure of Molecules* Benjamin 1964

Laidler, K.J. *Reaction Kinetics* vols 1 and 2 Pergamon 1963

Salzberg, H.W., Morrow, J.I. and Cohen, S.R. *Laboratory Course in Physical Chemistry* Academic 1966

Practical: The course will include inorganic preparations, reactions and techniques; advanced chemical and instrumental analysis; the preparation, purification, properties, identification and reactions of various organic compounds (emphasis will be placed on the use of modern physical and chemical techniques); a range of physical chemistry experiments, based on the second-year lecture course.

Class Requirements: Lectures – four a week for three terms. Tutorials – as arranged. Practical – a student taking Chemistry IIA will be required to work regularly in the laboratories for a minimum of four hours a week.

Examinations: Theory – three 2-hour written papers. Tests on theoretical background to practical course and the theory may be held throughout the year as required. The performance of each student in the practical laboratory course is assessed throughout the year and taken into account in determining the success of the student at the annual examination.

CHEMISTRY IIB

This course is suitable for students enrolled in the School of Agriculture but may be taken by other students who do not intend to take further courses in chemistry. Chemistry IIB is a terminal course.

Prerequisite: Chemistry I.

Inorganic and Analytical Chemistry

Syllabus: The principal features and descriptive inorganic chemistry of selected non-metallic and metallic elements; coordination chemistry; modern methods of separation and analysis in inorganic chemistry; elementary chemical statistics; theory and practice of radiochemistry.

Prescribed Book

MacKay, K.M. and McKay, R.A. *Introduction to Modern Inorganic Chemistry* revised edn, Intertext 1972

Recommended Books

Gould, E.S. *Inorganic Reactions and Structure* revised edn, Holt, Rinehart and Winston 1962

Duncan, J.F. and Cook, G.B. *Isotopes in Chemistry* Clarendon Press 1968

Ewing, G.W. *Instrumental Methods of Chemical Analysis* 3rd edn, McGraw-Hill 1969

Cotton, F.A. and Wilkinson, G. *Advanced Inorganic Chemistry* 3rd edn Interscience 1966

Organic Chemistry

Syllabus: Physical organic chemistry; carbohydrates, amino acids, proteins, terpenes, steroids, simple conformational analysis, optical activity; bio-organic mechanisms; natural products, biosynthesis.

Prescribed Book

Hendrickson, J.B., Cram, D.J. and Hammond, G.S. *Organic Chemistry* 3rd edn, McGraw-Hill, Int. Student Edn

Physical Chemistry

Syllabus: PC2.03 Thermodynamics and solutions, PC2.04 Reaction Kinetics, EITHER PC2.02 Experimental Molecular Structure OR PC2.05 Macromolecules, Colloids and Surface Chemistry.

Prescribed Book

Daniels, F. and Alberty, R.A. *Physical Chemistry* 3rd edn, John Wiley 1967

Recommended Books

Aylward, G.H. and Findlay, T.J.V., *SI Chemical Data* Wiley 1971

Barrow, G.M., *Physical Chemistry* 2nd edn, McGraw-Hill 1966
Moore, W.J., *Physical Chemistry* 3rd edn, Prentice-Hall 1962
Laidler, K.J., *Reaction Kinetics* vols 1 and 2 Pergamon 1963
Barrow, G.M., *The Structure of Molecules* Benjamin 1964
Salzberg, H.W., Morrow, J.I., and Cohen, S.R., *Laboratory Course in Physical Chemistry* Academic Press 1966

Practical: The course will include inorganic preparations, reactions and techniques; advanced chemical and instrumental analysis; the preparation, purification, properties, identification and reactions of various organic compounds (emphasis will be placed on the use of modern physical and chemical techniques); a range of physical chemistry experiments based on the second-year lecture course (emphasis will be placed on the use of modern physical and analytical techniques and on applications of thermodynamics).

Class Requirements: A course of approximately 80 lectures. Tutorials – as arranged. Practical – a student taking Chemistry IIB will be required to work regularly in the laboratories for four hours a week.

Examinations: Theory – three 2-hour written papers. Tests on the theoretical background to the practical course and the theory will be held throughout the year as required. The performance of each student in the practical laboratory course is assessed through the year and taken into account in determining the success of the student at the annual examinations.

CHEMISTRY COURSES FOR PHYSICAL SCIENCES II

The sections of the chemistry courses which may be taken in Physical Sciences II are: Inorganic Chemistry IIB, Organic Chemistry IIA or IIB, and Physical Chemistry IIA or IIB.

Each may be taken singly or in combination provided that chemistry is not taken as a major subject at the second-year level. The prerequisite for each is Chemistry I and each has a value of one third of a second-year unit.

CHEMISTRY IIIA

This is a two-unit course intended for the student wishing to major in chemistry alone.

Prerequisite: Chemistry IIA.

Inorganic and Analytical Chemistry

Syllabus: Systematic inorganic chemistry; chemistry of lanthanons and

actinons; general chemistry of the peroxy compounds of transition metals; hydrides with detailed treatment of boron hydrides; interhalogen compounds; poly-halides; experimental techniques in inorganic chemistry including NMR, ESR, Mossbauer, ORD, CD; inorganic stereochemistry and advanced ligand field theory; transition metal complexes with π-bonding; kinetics and mechanisms of reactions of coordination compounds; electrochemistry; thermochemistry, organo-metallic chemistry; statistics in chemistry; organic reagents in inorganic analysis; instrumental methods of analysis (this course deals with the theory and use of instruments of importance in inorganic and analytical chemistry, e.g. UV-visible spectrophotometry, infrared spectroscopy, atomic absorption spectrophotometry, thermogravimetry, polarography, etc).

Prescribed Books

Demitras, G.C., Russ, C.R., Salmon, J.F., Weber, J.H., Weiss, G.S. *Inorganic Chemistry* Prentice Hall 1972

Recommended Books

Dasent, W.E. *Inorganic Energetics* Penguin 1971

Basoło, F., and Pearson, R.G. *Mechanisms of Inorganic Reactions* Wiley 1967

Pecksok, R.L., and Shields, L.D. *Modern Methods of Chemical Analysis* Wiley 1968

Ewing, G.W. *Instrumental Methods of Chemical Analysis* McGraw-Hill 3rd edn 1969

Angelici, R.J. *Synthesis and Techniques in Inorganic Chemistry* Saunders 1969

Drago, R.S. *Physical Methods in Inorganic Chemistry* Reinhold 1965

Hill, H.A.O., and Day, P. *Physical Methods in Advanced Inorganic Chemistry* Interscience 1968

Browning, D.R. *Spectroscopy* McGraw-Hill 1969

Day, M.C., and Selbin J. *Theoretical Inorganic Chemistry* 2nd edn, Reinhold 1969

Cotton, F.A., and Wilkinson, G. *Advanced Inorganic Chemistry* 3rd edn Interscience 1966

Organic Chemistry

Syllabus: Theoretical organic chemistry and aromaticity; organic reaction mechanisms and orbital symmetry; IR and NMR spectroscopy; synthetic methods; heteroaromatic compounds; industrial organic chemistry; reactive intermediates and photochemistry. A literature review project will also be part of the course.

Prescribed Book

Hendrickson, J.B., Cram, D.J. and Hammond, G.S. *Organic Chemistry* 3rd edn, McGraw-Hill, Int. Student Edn.

Recommended Books

Woodward, R.B. and Hoffman, R. *The Conservation of Orbital Symmetry* Verlag Chemie 1970

Acheson, R.M. *An Introduction to the Chemistry of Heterocyclic Compounds* 2nd edn Wiley 1967

Pryor, W.A. *Introduction to Free Radical Chemistry* Prentice Hall 1966

Physical Chemistry

Syllabus: A total of at least six units, which must include PC 3.00 Computing. Students who choose to complete more than six units will be assessed on their best six results. The remaining units to be chosen from PC 3.01 Molecular Symmetry, PC 3.02 Molecular Structure, PC 3.03 Spectroscopy and Structure, PC 3.04 Spectroscopic Principles, PC 3.05 Diffraction Methods, PC 3.06 Mass Spectrometry, PC 3.07 Kinetics, PC 3.08 Statistical Mechanics.

Prescribed Book

McCracken, D.D. *A Guide to Fortran IV Programming* Wiley 1968

Recommended Books

Daniels, F. and Alberty, R.A., *Physical Chemistry* 3rd edn, John Wiley 1967

Barrow, G.M. *Physical Chemistry* 2nd edn, McGraw-Hill 1966

Moore, W.J. *Physical Chemistry* 3rd edn, Prentice-Hall 1962

Cotton, F.A., *Chemical Applications of Group Theory* Wiley, 1963

Levine, I.N., *Quantum Chemistry,* Vol I; Quantum Mechanics and Molecular Electronic Structure, Allyn and Bacon 1970

Murrell, J.N., Kettle, S.F.A. and Tedder, J.M., *Valence Theory* 1965

Banwell, C.N., *Fundamentals of Molecular Spectroscopy* McGraw-Hill 1966

Dixon, R.N., *Spectroscopy and Structure* Methuen 1965

Laidler, K.J., *Reaction Kinetics* vols 1 and 2 Pergamon 1963

Practical: Advanced inorganic, organic and physical chemistry, including preparations, analytical and special techniques. A student taking Chemistry IIIA will be required to work regularly in the laboratories for a minimum of 12 hours a week.

Class Requirements: Lectures – approximately seven a week for three terms. Tutorials/seminars – as arranged.

Examinations: The various sections of the Chemistry III course will be examined either during the year by projects or written papers, or at the end of the year by written papers. All inorganic and analytical examinations are held at the end of the academic year in November.

CHEMISTRY IIIB

This one-unit course is intended for those students who wish to specialize in chemistry jointly with a second subject.

Prerequisite: Chemistry IIA.

Inorganic and Analytical Chemistry

Syllabus: Systematic inorganic chemistry; chemistry of the lanthanons and actinons; general chemistry of peroxy compounds of transition metals; hydrides; experimental techniques in inorganic chemistry; inorganic stereochemistry and advanced ligand field theory; kinetics and mechanisms of reactions of coordination compounds; electrochemistry; thermochemistry; organic reagents in inorganic analysis; selection of instrumental methods of analysis.

Organic Chemistry

Syllabus: Four courses from those listed for Chemistry IIIA (consult with Professor Topsom).

Physical Chemistry

Syllabus: A total of at least three units chosen from those listed for Chemistry IIIA.

Prescribed Books: See Chemistry IIIA

Recommended Books: See Chemistry IIIA

Practical: Advanced inorganic, and organic and physical chemistry, including preparations, analytical and special techniques.

Class Requirements: Lectures – four a week for three terms. Tutorials – as arranged. Practical – a student taking Chemistry IIIB will be required to work regularly in the laboratories for a minimum of 6 hours a week.

Examinations: See Chemistry IIIA

Tests on the theoretical background to the practical course and the theory will be held throughout the year as required.

The performance of each student in the practical laboratory courses is assessed throughout the year and taken into account in determining the success of the student at the annual examinations.

CHEMISTRY COURSES FOR PHYSICAL SCIENCES III

The segments of the chemistry courses which may be taken in Physical Sciences III are: Inorganic Chemistry IIIB, Organic Chemistry III, and Physical Chemistry III.

Each may be taken singly or in combination provided that chemistry is not being taken as a major subject at the third-year level. The prerequisite for each is the appropriate course from Chemistry IIA or IIB and each has a value of one third of a third-year unit.

Students should note that completion of sections of the chemistry course in Physical Sciences III does not qualify them for admission to the honours school of chemistry, but that Physical Chemistry III may qualify them for admission to Chemical Physics IV.

CHEMISTRY IV – HONOURS COURSE

Prerequisite: Normally, a grade of at least C in Chemistry IIIA is required. Students who have performed well in Chemistry IIIB and another third-year subject may be admitted to the honours course.

Syllabus: The fourth-year course comprises more advanced study with lectures in all three branches: inorganic, organic, physical. All students are required to take nine units selected from the following list of courses, with the restriction that not less than one or more than five may be taken from those of any one group. Courses must be approved by the head of the department (Inorganic and Analytical, Organic, Physical) in which the student is undertaking the research project, and that marked with an asterisk (*) is obligatory for students undertaking the research project in inorganic chemistry.

On the experimental side, the value of training in research is recognized. There are no formal or set experiments, but each student is required at the beginning of the fourth-year course to opt for the branch of chemistry in which he wishes to undertake a research investigation. At the conclusion of the academic year, the student is required to write an original dissertation on the results of his work.

Inorganic and Analytical Chemistry

***Theoretical and the Determination of Molecular Structure (1 unit):** Elements of symmetry and group theory. Absorption spectroscopy – atomic spectra, spectroscopic terms; advanced ligand field theory (effect of crystal fields on spectroscopic terms); Orgel diagrams, Tanable-Sugano diagrams, correlation diagrams, selection rules, band intensities, etc.

Theory of magnetism. Magnetic behaviour of inorganic substances; magnetic properties of free ions; effect of crystal fields – orbital contributions; variation with temperature. Applications of molecular orbital theory in inorganic chemistry. Electron spin resonance and infrared spectroscopy of inorganic species.

Descriptive Inorganic Chemistry (1 unit): Electron deficient compounds, polyacids, carbides, nitrides, borides, tungsten bronzes, metal-sulphur chemistry, silicates, silicones, graphite, inorganic polymers.

Modern Techniques in Inorganic Analytical Chemistry (2 units)

1. Solvent extraction, theory and application.
2. Ion exchange, theory and application.
3. Atomic absorption spectroscopy.
4. Ion selective electrodes.
5. Gas chromatography of metal chelates.
6. Advanced electrochemical techniques.

Radiation Chemistry (1 unit): Introduction: radiation types and sources; radiolysis of water and aqueous solutions; radical and molecular products; radiation dosimetry – the Fricke dosimeter; determination of molecular and radical yields; radiation decomposition of gases; radiolysis of organic compounds; irradiation of polymers; uses of radiation chemistry.

Stereochemistry and Reaction Mechanisms (1 unit): This course deals mainly with inter and intra-molecular rearrangements in transition and non-transition metal complex species. Topics include geometrical isomerism and equilibria in 4 and 6-coordinate species; reactions of optically active metal complexes (e.g. inversion, racemization) including a consideration of absolute configuration, conformational analysis stereoselective and stereospecific ligands and reactions, stereochemically non-rigid (fluxional) molecules; ligand exchange reactions.

Instrumental Techniques in Inorganic Chemistry (1 unit): 1. Thermodynamic techniques: (a) Capsule and titration calorimetry.
2. Spectroscopy techniques. (a) Electron spin resonance. (b) Mossbauer spectroscopy, (c) Nuclear quadrupole resonance spectroscopy.

Metal Catalysis in Inorganic, Organic and Bio-chemistry (1 unit): Factors contributing to the activity of metal catalysts. Electron transfer reactions. Catalytic activation of hydrogen and other saturated molecules. Hydrogenation, isomerisation, hydroformulation of olefins and acetylenes. Oligomerisation and polymerisation of olefins. Olefin disproportionation. Activation of carbon-carbon and carbon-hydrogen sigma bonds. Nitrogen

fixation. Oxygen transport. Transport of ions through cell walls.

Organic Chemistry

Theoretical Organic Chemistry: The course will introduce modern theoretical calculations on organic molecules with particular reference to their assumptions and the resulting utility and accuracy. The dependence of ground state properties of organic molecules on electron distribution will be reviewed.

Physical Organic Chemistry: The correlation prediction, and present understanding of certain physical properties, spectra, equilibria and reaction rates of organic molecules will be considered. An account of the present views on substituent effects and their transmission.

Organic Synthesis: The course will deal with recent methods devised for the synthesis of organic compounds. The synthesis of stereochemically strained and naturally occurring compounds will also be discussed.

NMR Spectroscopy: Analysis of spectra. Time-dependent phonomena. Relaxation and Overhauser effects. Double quantum and double resonance phenomena.

Heterocyclic Chemistry: Aspects of the chemistry of pyridine and related compounds, with emphasis on the reactions of pyridinium compounds.

The Chemistry of Drugs: Theories of drug action. Antagonists and detoxification pathways. Methods of drug design. Optimization methods. The chemical basis of drug interactions.

Physical Chemistry

PC.4.01 Group Theory: Elements of group theory, groups, symmetry in molecules, classification of molecules, matrix representation of groups, character table. Applications of group theory in chemistry, molecular vibration, atomic and molecular integrals, selection rules, molecular orbitals, derivation of symmetry adapted orbitals, splitting of degenerate states by crystal field.

PC 4.02 Molecular Electronic Structure: Single particle systems solution of Schroedinger equation for free particle, particle in constant potential wells, hydrogen-like atom; atomic systems, Hartree approximation, Hartree-Fock method, calculations on many-electro atoms; small molecular systems, Born-Oppenheimer Approximation, Roothaan equations, ab-initio LCAOMO method; large molecular systems, semi-empirical MO methods, extended Huckel method, CNDO method.

PC 4.03 Photoelectron Spectroscopy: Theory of photoelectron spectroscopy, instrumental methods, high resolution spectra of atoms and small molecules, low resolution spectra of large molecules, chemical shift of core electron binding energy.

PC 4.04 Advanced Spectroscopy: Angular distributions in photoelectron spectroscopy; electronic spectra of atoms, ions, and diatomic molecules; nuclear quadrupole and electron resonance spectroscopy; natural linewidths and magnetic resonance relaxation.

PC 4.05 Crystallography: Crystal symmetry; X-ray and neutron diffraction; diffraction theory; the phase problem; vector and Fourier methods; direct methods of structure determination; structures of large molecules; examples of crystal structure analysis.

PC 4.06 Mass Spectrometry: Theory of mass spectra; energies of ionization – dissociation processes; high resolution mass spectroscopy.

PC 4.07 Free Radical Kinetics: Elementary radical reactions in the gas phase, theoretical estimation of rate parameters, kinetic isotope effects.

PC 4.08 Chemical Information Theory: The mathematical basis of information theory; experiments considered as a communication situation; noise, redundancy, coding; pattern recognition; fourier transforms; deconvolution; chemical structure codes.

PC 4.09 Molecular Dynamics: Decay of excited states – fluorescence, phosphorescence and internal conversion; electron impact excitation and ionization; ion cyclotron resonance and ion-molecule reactions; molecular beams – techniques, nonreactive, and reactive collisions.

Practical: Each student is required to work on a research problem under the supervision of a member of staff of the department in a field of his own selection (inorganic, organic, physical, analytical). At the end of the research investigation, each student is required to write and submit a dissertation.

Class Requirements: A feature of the honours course will be student seminars. All students are also expected to attend the departmental research colloquia.

Examinations: To be advised. Physical chemistry examinations will normally be held within a few weeks of completion of the relevant lecture courses. All inorganic and analytical examinations are held at the end of the academic year in November.

Prescribed and Recommended Reading

INORGANIC AND ANALYTICAL CHEMISTRY: At the beginning of

each lecture course, prescribed and recommended reading is advised by the lecturer concerned.

ORGANIC CHEMISTRY: Prescribed reading to be advised for enrolling students.

PHYSICAL CHEMISTRY: Prescribed reading to be advised for enrolling students.

HONOURS PRIZE

The Society of Chemical Industry of Victoria awards an annual prize, $25 and a certificate, to the top student in the chemistry honours year.

POSTGRADUATE STUDIES

The department offers research programs leading to the degrees of M Sc or Ph D. For admission to candidature for the degree of Master of Science, applicants should normally have, or expect to receive the degree of Bachelor of Science with honours in chemistry from this or an accredited university. Students with high standing in general-degree courses, or who hold a diploma, certificate or qualification recognized and approved by the University as equivalent to a degree or a suitable alternative to a primary degree may be granted admission after attending a preliminary course and passing a preliminary examination.

Admission to candidature for the degree of Doctor of Philosophy may be granted to applicants who hold the degree of Master of Science from this or an accredited university, have high standing in the degree of bachelor with honours or hold the pass degree of bachelor and have passed a preliminary examination in this University for the degree of master not less than one academic year after having qualified for the pass degree of bachelor.

Both the M Sc and Ph D degrees require the submission of a thesis reporting the results of original research carried out under supervision. In certain cases, the department may be prepared to consider applications from candidates for admission to candidature for the degree of M Sc by examination. In certain circumstances, the degrees may be obtained by part-time research study.

Prospective candidates for the M Sc or Ph D degrees should write in the first instance to the professor of the department concerned for further information:

Professor R.J. Magee, Head, Department of Inorganic and Analytical Chemistry.

Professor R.D. Topsom, Head, Department of Organic Chemistry.

Professor J.D. Morrison, Head, Department of Physical Chemistry. Excellent facilities are available for research in a wide range of specialist fields:

Inorganic and Analytical Chemistry

Preparative, spectroscopic (u.v.-visible, i.r., e.s.r., n.m.r.) and structural studies on metal chelates of transitional metals. Sulphur ligand complexes: metal xanthates, dithiocarbamates, thiocarbamates and related compounds. Electrochemistry: polarographic, cyclicvoltammetric and chronopotentiometric studies on inorganic systems. Solvent extraction studies using neutral and acidic alkyl phosphoric acid esters and high molecular weight amines. Radiation and radio-chemistry. Inorganic analytical chemistry. Magnetochemistry of inorganic species. Gas chromatography of metal chelates. Selective ion electrode studies. Thermochemical studies on coordination compounds: titration and capsule calorimetry. Inter and intra-molecular rearrangements of four and six-coordinate transition metal complexes in solution. Design of stereospecific ligands in four and six-coordinate metal complexes. Studies of metal complexes having biological significance. Studies of oxidation-reduction and acid-base reactions of transition metal compounds in molten salts – nitrates, nitrites and acetates of alkali metals. Synthetic and catalytic chemistry of transition metal ions. Stabilization of unstable species by transition elements. Molecular nitrogen compounds. Development of the use of contact shift measurements in rapidly exchanging systems to determine coordination structures in solution. The use of pressure to probe mechanisms of inorganic reactions.

Organic Chemistry

Physical organic chemistry including effects of steric and electronic factors on the reactivity and properties of aromatic and heteroaromatic compounds; theoretical and spectroscopic studies on molecular structure of organic compounds; infrared intensity studies; mechanisms of aromatic and heterocyclic reactions; solvent effects on reaction mechanisms; synthesis, reactivity and stereochemistry of aromatic molecules; chemistry of naturally occurring compounds; synthesis and properties of polycyclic hydrocarbons; mechanism of drug activity; studies in water pollution.

Physical Chemistry

Self-consistent-field LCAOMO calculations on molecules containing atoms from the second and third rows of the periodic table. The role of 3d-orbitals in bonding. Localized molecular orbitals.

Single crystal structural studies by X-ray and neutron diffraction.

Geochemical studies of minerals using standard and flameless atomic absorption, X-ray fluorescence, spectrographic, mass spectrometric and other analytical techniques.

Kinetics of elementary radical reactions in the gas phase. Recombination of small alkyl and substituted alkyl radicals studied by the rotating sector technique; hydrogen abstraction reactions of small radicals and isotope effects in such reactions.

Molecular dynamics and energetics studies by magnetic relaxation behaviour and the photoejection of electrons. Photoelectron energies and angular distributions of small molecules in absorbed and gaseous phases.

The study of the upper energy states of molecules and the ionization-dissociation processes induced by photon and electron impact in the mass spectrometer.

The application of the computer-controlled GLC mass spectrometer to the study of complex organic mixtures such as odors and flavors. Development of computer programs for ab-initio structure determination from the mass spectra. The design of mass spectrometers.

Isotope ratio measurements of oxygen and sulphur. Paleotemperature studies.

Air and water pollution studies of the Victorian environment.

ECONOMICS

For details see the volume of the handbook containing disciplines offered by the School of Social Sciences.

GENETICS

GENETICS II

A general course based on the genetical and evolutionary section of Biology IA and IB. It is divided into six units of equal length:

1. Human biology
2. Analytical genetics
3. Population and quantitative genetics
4. Elementary cytogenetics
5. Biochemical genetics
6. Elementary microbial genetics

The course is both complete in itself, and serves as an introduction to Genetics III, since it covers all the major areas of genetics and related disciplines at a higher level than in Biology IA and IB. Disciplines which are recommended to be taken with Genetics II, include mathematics, statistics, biochemistry, botany and zoology.

Prerequisites

1. Biology IA and IB, but in special circumstances one of these subjects is sufficient.
2. A minimum of one of Chemistry I, Physics I, and a branch of first-year mathematics.

Recommended Reading

Srb, A.M., Owen, R.D., and Edgar, R.S. *General Genetics* 2nd edn, Freeman 1965

Harrison, G.A., Weiner, J.S., Tanner, J.M. and Barnicot, N.A. *Human Biology: An Introduction to Human Evolution, Variation and Growth* Clarendon Press, Oxford 1964

Bishop, O.N. *Statistics for Biology* 2nd edn, Longman 1971

Recommended References

Falconer, D.S. *Introduction to Quantitative Genetics* Oliver and Boyd 1960

Mettler, L.E. and Gregg, T.G. *Population Genetics and Evolution* Prentice Hall 1969

Parsons, P.A. *The Genetic Analysis of Behaviour* Methuen 1967

Davis, B.D., Dulbecco, R., Ginsberg, H.S., Eisen, H.N. and Wood, W.B. *Principles of Microbiology and Immunology* Harper and Row 1968

Hayes, W. *The Genetics of Bacteria and their Viruses* 2nd edn, Blackwell 1968

Stent, G. *Molecular Genetics* Freeman 1971

GENETICS III

An advanced course based on Genetics II as a prerequisite. The course will consist of: microbial, molecular, and developmental genetics (40 lectures); behavioural, ecological, quantitative, and population genetics (40 lectures); radiobiology and related topics (20 lectures).

Recommended Reading

Du Praw, E.J. *DNA and Chromosomes* Holt, Rinehart and Winston 1970

Lawrence, C.W., *Cellular Radiobiology* Arnold 1971

Markert, C.L. and Ursprung, H. *Developmental Genetics* Prentice Hall 1971

Parsons, P.A. *Behavioural and Ecological Genetics: a Study in Drosphila* Oxford 1973

Watson, J.D. *Molecular Biology of the Gene* 2nd edn, Benjamin 1970

Recommended References

Du Praw, E.J. *Cell and Molecular Biology* Academic Press 1968
Falconer, D.S. *Introduction to Quantitative Genetics* Oliver and Boyd 1960
Mather, K. and Jinks, J.L. *Biometrical Genetics* Chapman and Hall 1971
Mettler, L.E. and Gregg, T.G. *Population Genetics and Evolution* Prentice Hall 1969
Wallace, B. *Topics in Population Genetics* Norton 1968

HONOURS

The course will consist of a special research project, essays, prescribed reading courses, and such other work as may be required by the chairman of the department. Graduates from other universities will be admitted if they are of adequate standard. Students intending to do honours should consult the chairman of the department.

POSTGRADUATE STUDIES

M Sc and Ph D (by research)

Prospective candidates should consult the chairman of the department for further details. Research is currently in progress in the following fields:

1. Behavioural, ecological and physiological genetics of *Drosophila* and mice.
2. Quantitative genetics of *Drosophila* and man.
3. Biochemical genetics of *Drosophila.*
4. Population genetic studies with Australian native plants and cytogenetics of grasshoppers.
5. Radiobiology and radiation genetics in *Drosophila,* grasshoppers and bacteria.
6. Physical anthropology of Australian Aborigines, and human variation in local and Aboriginal populations.
7. Microbial genetics (bacteria and fungi).
8. Development genetics.

M Sc (by examination in Applied Genetics)

A course in applied genetics will be offered for those with an honours degree or its equivalent in science, agriculture or medicine. The purpose of the course is to provide training in one or more of the following fields from the applied point of view:

1. Animal and plant breeding.
2. Human genetics and physical anthropology.

3. Microbial genetics.
4. Radiobiology.

The course consists of advanced lectures, essays, and prescribed reading in one or more of the above topics, together with a small project, and such other work as may be required by the chairman of the department. In the case of candidates with a deficient background in genetics, preliminary reading will be prescribed by the chairman of the department. The duration of the course is normally 10 months.

Those interested in the above course will be considered for 1973, but it is possible that not all of the above fields will be available in 1973. Intending candidates should consult the chairman of the department.

GEOLOGY

For twenty years Australia has had a succession of mineral 'booms'. The last one not only led to an extraordinary demand for trained geologists but it also showed that all Australians need to have an elementary knowledge of geology. The need for geology as a cultural subject is highlighted by the estimate that Australia's export earnings for 1980 from minerals and mineral products alone will exceed the record total export earnings for 1971-1972 ($1,289 million). Apart from economic aspects geology provides an understanding of the environment in which we live.

Geology draws heavily on other branches of science and hence the aim of the Geology Department is to provide courses that give a fundamental grounding in geology as well as allowing sufficient time in the undergraduate years for a student to obtain a sound grasp of science in general. Students intending to graduate in geology will normally take one of physics, chemistry or mathematics as well as geology to the third-year level.

The Geology Department offers courses leading to the B Sc (pass) and B Sc (honours) degrees within the School of Physical Sciences. Teaching at the first-year level began in 1972. Second year will be added in 1973 although the numbers of students may have to be restricted at this level.

Third-year courses will be added in 1974. Postgraduate courses will be available as soon as the department is suitably established.

GEOLOGY I

Prerequisites: Students will normally be expected to have obtained a pass in either chemistry or physics at the higher school certificate or an approved equivalent. No previous knowledge of geology is assumed.

Syllabus:

1. Earth materials and their relationships: crystals, minerals, rocks of various types, economic mineral deposits; deformation of rocks – faults, folds and other structures.
2. Earth processes: the concept of geologic time, fossils and stratigraphy; plate theory, the formation of mountains and 'continental drift'.

Class Requirements: Three lectures, and one 3-hour practical period a week for three terms. Attendance at field classes held on occasional Saturdays or Sundays during the session forms an essential part of the course: these are given in lieu of tutorial classes.

Prescribed Reading

Verhoogen, J., Turner, F.J., Weiss, L., Wahrhaftig, C. and Fyfe, W.S. *The Earth: an Introduction to Physical Geology* Holt Rinehart and Winston

Dana, E.S. (Hurlbut) *Manual of Mineralogy* Wiley (paperback)

Reference Books: The following books are referred to in lectures from time to time:

Badgley, P.C. *Structural Methods for the Exploration Geologist* Harper 1959

Clark, S.P. *Structure of the Earth* Prentice-Hall 1971 (paperback)

Eicher, D.L. *Geologic Time* Prentice-Hall 1968 (paperback)

Gass, I.G.; Smith, P.J. and Wilson, R.C.L. eds *Understanding the Earth* Artimis Press 1971 (paperback)

Garrels, R.M. and MacKenzie, F.T. *Evolution of Sedimentary Rocks* Norton 1971

Hills, E.S. *Elements of Structural Geology* 2nd edn, Science 1972 (paperback)

Pettijohn, F.J. *Sedimentary Rocks* 2nd edn, Harper 1957

Phillips, F.C. *The Use of Stereographic Projection in Structural Geology* Arnold 1954

Stacey, F.D. *Physics of the Earth* Wiley 1969

Wedepohl, K.H. *Geochemistry* Holt, Rinehart and Winston 1971

Wilson, J.T. ed *Continents Adrift* Readings from Scientific American, Freeman 1971 (paperback)

GEOLOGY II

Prerequisites: Geology I is normally required. Students taking the crystal optics part of the course only, should have passed in either Geology I, Physics I or Chemistry I. The four courses listed below, together constitute a full course in Geology II: all are required by those students wishing to proceed to third year.

Crystal Optics (3 credit points)

Syllabus: Polarized light; isotropic and anisotropic media, the polarizing microscope; refractive index measurement by immersion and mineral identification; interference of light; the uniaxial and biaxial indicatrix; orthoscopic and conoscopic examination of uniaxial and biaxial crystals; interference figures. Practical applications of optical crystallography, particularly in mineralogy.

Prescribed Reading

Bloss, D.F. *An Introduction to the Methods of Optical Crystallography* Holt, Rinehart and Winston 1961

Deer, W.A., Howie, R.A. and Zussman, J. *An Introduction to Rock Forming Minerals* Longmans Green 1966

Igneous Petrology (3 credit points)

Syllabus: A study of those rocks formed from silicate melts with particular reference to their chemical composition and mineral phase relationships. Classification of rocks according to their occurrence in space and time; phase equilibrium of silicate melts; optical study of igneous rocks in thin section; ore deposits of igneous origin; structural relationships of igneous rocks.

Prescribed Reading

Joplin, G.A. *A Petrography of Australian Igneous Rocks* Angus and Robertson 1971

Metamorphic Petrology (3 credit points)

Syllabus: A study of those rocks that have crystallized or recrystallized in the solid state. Facies classification; metamorphic rocks in space and time; optical study of various suites of metamorphic rocks from contact and regional environments; subsolidus phase relationships of metamorphic minerals; ore deposits associated with metamorphic; structural relationships of metamorphic rocks.

Prescribed Reading

Turner, F.J. *Metamorphic Petrology* McGraw-Hill 1968

Joplin, G.A. *A Petrography of Australian Metamorphic Rocks* Angus and Robertson 1967

Sedimentology (3 credit points)

Syllabus: Sedimentology will concentrate on the evolution of the earth's atmosphere and ocean as well as the chemical balance of the oceans in relation to rock weathering and the accumulation of sedimentary rock sequences. Modern and ancient sediments; application of the computer and statistical methods; stratigraphy: economic aspects of sedimentary rocks.

Prescribed Reading

Garrels, R.M. and MacKenzie, F.T. *Evolution of Sedimentary Rocks* Norton 1971

Reference Books

Bevington, P.R. *Data Reduction and Error Analysis for the Physical Sciences* McGraw-Hill 1969

Ernst, W. *Geochemical Facies Analysis* Elsevier 1970

Krumbein, W.C. and Graybill, F.A. *An Introduction to Statistical Models in Geology* McGraw-Hill 1965

Pettijohn, F.J. *Sedimentary Rocks* 2nd edn Harper 1957

Class Requirements: A total of 8 hours formal teaching is required. Two lectures and two 3-hour sessions have been timetabled so that the three-hour session may be used for either lectures or practicals. A field excursion will be scheduled for a five-day period during the August vacation.

Examinations: Two 3-hour examinations or four 1½-hour papers and assessment of laboratory and fieldwork.

MATHEMATICS

A student who wishes to major in mathematics may do so in any one of the Schools of Humanities, Physical Sciences and Social Sciences. Which School such a student will seek to enter depends partly upon his preferences so far as supporting subjects (and possible alternative majors) are concerned. He will also need to take into account the way the different regulations of these Schools affect the choice and flexibility of the mathematics subjects he may wish to choose.

Courses will be given in three disciplines, namely, pure mathematics, applied mathematics, and mathematical statistics. Subjects available in

1973 are Mathematics IA, IB and IC, Pure Mathematics II and III, Applied Mathematics II and III, Mathematical Statistics II and III and Mathematics IV.

First-year mathematics subjects do not specialize in any branch of mathematics: each is designed to give the student a broadly-based introduction to mathematical principles, techniques and their applications.

Students enrolled in the School of Physical Sciences, who wish to take a unit in mathematics, are required to take Mathematics IA.

Students who take only Mathematics IA may take mathematical statistics II and some second-year pure and applied mathematics components as part of Physical Sciences II. Mathematics IC is a terminal course and is incompatible with both Mathematics IA and Mathematics IB.

The main feature of mathematics subjects at second and third-year level is the choice allowed each student in planning his syllabus. This is achieved by dividing each subject into a number of components: students are allowed some degree of freedom in choosing their components, in taking some third-year components in second year and vice-versa, and in taking some of their components outside the subject in which they are formally enrolled. The choice is necessarily restricted in second year, where many components are compulsory, but a wider choice will be available in third year.

Students wishing to obtain an honours degree in mathematics must complete the subject Mathematics IV. In addition to coursework and examinations in this subject each student must write a thesis, the assessment of which will count toward his final result.

FIRST-YEAR SUBJECTS

Mathematics IA, IB and IC

The subjects offered in first year are Mathematics IA, IB and IC. Students taking IB must take IA concurrently. IC is a terminal course. Mathematics IA introduces some basic concepts and techniques of mathematics and motivates them by referring to their use in the various sciences. Mathematics IB consists of two half courses. In one of these the emphasis is on further development of the concepts introduced in IA. In the other the emphasis is on applications, especially to the physical sciences. Mathematics IC is designed principally to meet the requirements of students in the Schools of Agriculture, Biological Sciences and Social Sciences, although it may prove useful to those seeking a general introductory course in mathematics. Students who have passed the higher

school certificate examinations in Pure Mathematics and Applied Mathematics and who wish to take only one mathematics subject should enrol in Mathematics IA rather than in Mathematics IC.

Students should note that Physical Sciences IT is available to students not in the School of Physical Sciences.

Prerequisites: While there are no formal prerequisites for any first-year mathematics subject, students are warned that the level of subjects in mathematics is determined under the assumption that:

1. each student enrolled for Mathematics IC has passed the Higher School Certificate Examination in general mathematics;
2. each student enrolled in Mathematics IA has passed the Higher School Certificate Examination in both pure mathematics and applied mathematics.

Students in the School of Physical Sciences must take Mathematics IA rather than IC. Students who enrol in Mathematics IA with only general mathematics will be required to attend additional tutorials.

Students who have reached only leaving standard in the relevant mathematics subjects are not barred from enrolment but should consult the chairman of the mathematics department before enrolling.

Students intending to take second-year mathematics subjects should note:

(a) Mathematics IA is normally a prerequisite for Mathematical Statistics II;

(b) Mathematics IA and IB are both normally prerequisites for Pure Mathematics II and for Applied Mathematics II.

These prerequisites can only be waived by special permission of the chairman of the Mathematics Department.

Students intending to take Mathematical Statistics III should note that it is strongly recommended that they take Pure Mathematics II. Those students are therefore strongly recommended to take Mathematics IB in first year.

Students intending to do Applied Mathematics III are required to take the Pure Mathematics components PM201, PM202 and PM203 in addition to Applied Mathematics II. Such students are strongly advised to take Pure Mathematics II as a second-year subject.

Students intending to take Physical Sciences II, who obtain a pass in Mathematics IA only, will be allowed to choose from among the following second-year mathematics components to make up part or all of the requirements for that subject: PM203, PM205, PM208, PM210, AM201,

AM202, ST201, ST202, ST203, ST204, ST205, ST206, ST207, ST208.

In special cases prerequisites may be waived by the chairman of the Mathematics Department.

Preliminary Reading

Adler, I. *The New Mathematics* Mentor

Bell, E.T. *Mathematics, Queen and Servant of Science* McGraw-Hill

Kline, M. *Mathematics and the Physical World* Anchor

Smith, J.M. *Mathematical Ideas in Biology* Cambridge University Press

Mathematics IA Syllabus: Logic, sets, functions. Number systems. Vector algebra. Calculus. Differential equations. Matrices and determinants. Probability and statistics.

Mathematics IB Syllabus: Algebraic structures, linear algebra. Analysis. Statics. Elementary mechanics of particle and rigid body. Mathematical models. Numerical methods.

Mathematics IC Syllabus: Topics in finite mathematics, linear algebra, elementary programming, and some systematic calculus. Ideas and methods of mathematical statistics and the interpretation and design of experimental techniques.

Class Requirements in Each Subject: A total of five class hours a week (including tutorials). Regular written exercises.

Examination Requirements and Assessment in Each Subject: Two 3-hour written papers. The results of written exercises and tests given during the year will be taken into account in the final assessment.

SECOND-YEAR SUBJECTS

Pure Mathematics II, Applied Mathematics II and Mathematical Statistics II.

Three mathematics subjects at the second-year level are offered, namely Pure Mathematics II, Applied Mathematics II and Mathematical Statistics II. The lecture course in each subject is divided up into a number of components, each with a value expressed in terms of credit points, and students are allowed some measure of freedom in their choice of components. Subject to the restrictions listed below, a student taking one mathematics subject must select components totalling at least 12 credit points, for two mathematics subjects at least 24 credit points, and for three mathematics subjects at least 36 credit points. The restrictions applying in the various subjects are:

Pure Mathematics II: Components PM201, PM203 and PM204 are

ompulsory. PM202 is a prerequisite for Pure Mathematics III.

Applied Mathematics II: Components AM201, AM202, AM203 are compulsory. AM204 is normally a prerequisite for Applied Mathematics II.

Mathematical Statistics II: Components ST201 and ST202 are compulsory. ST203 is a prerequisite for Mathematical Statistics III.

To exemplify the above rules, the following is an allowable selection of components for a student enrolled in Pure Mathematics II: PM201, PM202, PM203, PM204, AM202, ST206.

Students should contact the chairman of the Mathematics Department when enrolling in any of the above subjects to discuss their choice of components: advisers from the department will be available at times to be arranged.

Students should note that the subject Physical Sciences II is available. A student enrolled in this subject may select various second-year mathematics components to make up some or all of his workload in this subject.

Prerequisites: These are shown in the following table. In each case the appropriate prerequisite must be passed at a standard determined by the chairman of the Mathematics Department. Students will be notified with their examination results if they have not reached this standard.

Subject	Prerequisite
Applied Mathematics II	Mathematics IA and Mathematics IB
Pure Mathematics II	Mathematics IA and Mathematics IB
Mathematical Statistics II	Mathematics IA

In addition to the subject prerequisites given above, note that each of the components listed below has its own prerequisites. These prerequisites may be either a first-year subject or another second-year component or both. In particular, a student who has passed Mathematics IA only may take components from the following: PM203, PM205, PM208, PM210, AM 201, AM202, ST201, ST202, ST203, ST204, ST205, ST206, ST207, ST208.

In special cases prerequisites may be waived by the chairman of the Mathematics Department.

Students intending to take third-year subjects should consult the prerequisites for those subjects, before choosing their second-year components. Students intending to take Applied Mathematics III must pass PM201, PM202 and PM203. Students intending to take Mathematical Statistics III should take Mathematical Statistics II and are strongly recommended to take Pure Mathematics II also. They are also advised to

take the component AM201. Students intending to take final honours in mathematics must pass the subject Pure Mathematics II, and should also consult the prerequisites for final honours-year components.

Preliminary and Prescribed Reading: A list of books for preliminary and prescribed reading will be handed out to all students at the end of 1972. Further prescribed reading in various components may be given during the lectures in these components.

COMPONENTS AVAILABLE

The components available for 1973 are listed below. The department may cancel any component in which insufficient interest is shown, or may offer further components. The letters in the code indicate whether the component is pure mathematics (PM), applied mathematics (AM), or mathematical statistics (ST).

The components in pure mathematics are normally offered as follows:
Term 1: PM201 and PM203
Term 2: PM202, PM204 and PM210
Term 3: PM206, PM209 and PM205
PM208 is normally given in term 1 and the first three weeks of term 2.

PM201 Analysis A (two credit points) (prerequisite: Mathematics IB)
Fundamental properties of real numbers. Bounds, completeness and convergence. Properties of real valued continuous functions.

PM202 Analysis B (two credit points) (prerequisite: PM201)
Elementary topological properties in the context of normed vector spaces. Linear maps, continuity and boundedness. Integration in terms of a linear map defined on spaces of functions.

PM203 Linear Algebra (two credit points) (prerequisite: Mathematics IA)
Finite dimensional vector spaces. Linear transformations and matrices. The dual space. Characteristic and minimal polynomials. The primary decomposition theorem. Bilinear forms.

PM204 Abstract Algebra A (two credit points) (prerequisite: Mathematics IB)
Introduction to groups and rings. Homomorphisms, normal subgroups and ideals, homomorphism theorems. Integral domains and fields. Congruences.

PM205 Linear Programming (two credit points) (prerequisite: Mathematics IA)
Linear inequalities. Duality. Simplex computations. Matrix games.

PM206 Abstract Algebra B (two credit points) (prerequisite: PM204)

A continuation of PM204. Commutative rings, leading to field extensions. Ruler and compass constructions. Finite abelian groups.

PM208 Formal Logic A (four credit points) (prerequisite: Mathematics IA) (This component is identical with Philosophy IIFA/IIIFA).
Introduction to truth-functional and quantificational logic. An examination of some fundamental concepts of logic.

PM209 Analysis C (two credit points) (prerequisite: PM202)
Introduction to convergence in the abstract. Convergence in function spaces. Nets and filters, limit structures. Elementary topology and metric spaces.

PM210 Geometry (two credit points) (prerequisite: Mathematics IA)
Some simple propositions of ordered geometry, namely affine and absolute geometries, are introduced.

AM201 Mathematical Methods (four credit points) (prerequisite: Mathematics IA)
Complex variables. Summation of series. Difference equations. Partial differentiation. Maxima and minima. Improper integrals. Double integrals. Differential geometry. Eigenvalues of matrices. Grad, div and curl. Integral theorems. Applications. Tensors.

AM202 Ordinary Differential Equations (two credit points) (prerequisite: Mathematics IA)
Standard methods of integration of differential equations. Theory, methods of solution and applications of linear differential equations. Special functions.

AM203 Partial Differential Equations (two credit points) (prerequisite: Mathematics IB, AM202)
First and second order partial differential equations. Classification Methods of solution. Fourier series. Equations arising in physical, biological and social sciences.

AM204 Mechanics (four credit points) (prerequisite: Mathematics IB)
Vectorial mechanics. Analytical mechanics. Lagrange's equations. Small oscillations.

AM205 Numerical Analysis (two credit points) (prerequisite: Mathematics IB)
Elementary error analysis. Iterative methods. Solution of systems of linear equations and ordinary differential equations. Introductory computer programming: Fortran IV.

AM206 Wave propagation (one credit point) (prerequisite: AM203)

Modes. Superposition. Polarization. Interference. Diffraction. Pulses and packets.

ST201 Introduction to Probability Theory (three credit points) (prerequisite: Mathematics IA)
Sample spaces, events, probability, random variables, distribution and density functions. Moments, expectations, special distributions, central limit theorem.

ST202 Introduction to Statistics (three credit points) (prerequisite: ST201)
Application of the results of ST201 to problems of statistical inference; in particular chi-squared, t and F tests.

ST203 Correlation and Regression (three credit points) (prerequisite: ST202)
The relationship between two or three random variables. The relationship between a random variable and one or more independent variates. An introduction to the analysis of variance.

ST204 Design and Analysis of Experiments (one credit point) (prerequisite: ST203)
The design of experiments and associated analyses of variance.

ST205 Applied Regression (one credit point) (prerequisite: ST203)
Selected topics in applied regression. Response-surface analysis, discriminant functions, non-linear regression models, comparison of predictor variables. Choice of designs.

ST206 Sampling Theory (two credit points) (odd-numbered years only) (prerequisite: Mathematics IA)
Methods of analysis of sample surveys; simple random sampling; cluster sampling; stratified sampling.

ST207 Stochastic Processes (three credit points) (prerequisite: Mathematics IA)
Generating functions and applications. Random walks. Markov chains in discrete and continuous time.

ST208 Mathematical Genetics (one credit point) (prerequisite: Mathematics IA)
Application of mathematical models to Mendelian inheritance.

Class Requirements: Lectures – about nine for each credit point. Tutorials or practice classes as arranged for each component. Regular written exercises in each component.

Examination Requirements: About three 3-hour written papers in each subject. The number may vary according to the components chosen.

Shorter papers may be set in some components. The final result will take into account exercises and tests held throughout the year.

THIRD-YEAR SUBJECTS

Pure Mathematics III, Applied Mathematics III, Mathematical Statistics III.

Three mathematics subjects at the third-year level are offered, namely Pure Mathematics III, Applied Mathematics III and Mathematical Statistics III. A component system similar to that operating for second year subjects will apply. Subject to the restrictions listed below, a student taking one mathematics subject must select mathematics components totalling at least 18 credit points and for two subjects at least 36. It will be possible in certain cases for students to select a small number of second-year components instead of third-year components.

Students should contact the chairman of the Mathematics Department when enrolling in any of the above subjects to discuss their choice of components: advisers from within the Department will be available at times to be arranged.

A student must take at least 12 credit points from the subjects in which he is enrolled, and may make up the reminder from any mathematics subjects: in addition to this restriction, AM301 and AM302 are compulsory for Applied Mathematics III and ST301 and ST302 are compulsory for Mathematical Statistics III. At most one of PM312 and PM316 may be offered as part of third-year mathematics units.

Students are also reminded that the subject Physical Sciences III is available. Students taking this subject may take some or all of their components from any of those listed below for which they have the required prerequisites.

Prerequisites

These are shown in the following table. In each case the appropriate prerequisite must be passed at a standard determined by the chairman of the Mathematics Department. Students will be notified with their examination results if they have not reached this standard.

Subject	Prerequisite
Applied Mathematics III	Applied Mathematics II (normally including AM204), PM201 and, after 1973, PM202 and PM203.
Pure Mathematics III	Pure Mathematics II, including PM202

Mathematical Statistics III	Mathematics Statistics II, including ST203

In addition, students taking Mathematical Statistics III are strongly recommended to have taken Pure Mathematics II.

Note: Each component has its own prerequisite; in special cases prerequisites may be waived by the chairman of the Mathematics Department.

Students intending to take final honours in mathematics must have passed the subject Pure Mathematics II and should consult the various prerequisites for final-honours components before choosing their third-year components.

Preliminary and Prescribed Reading: A list of books for preliminary and prescribed reading will be handed out to all students at the end of 1972. Further prescribed reading in various components may be given during the lectures in these components.

COMPONENTS AVAILABLE

The components for 1973 are listed below. The department reserves the right to cancel any component in which insufficient interest is shown, or may offer further components. The letters in the code indicate whether the component is pure mathematics (PM), applied mathematics (AM) or mathematical statistics (ST).

PM301 Linear Algebra (two credit points) (prerequisite: PM203)
Inner-product spaces. Self-adjoint and normal operators, eigenvalues and eigenvectors. Projections and the spectral theorem. Completely continuous operators.

PM302 Measure Theory (three credit points) (prerequisite: PM305)
General measures on σ-algebras. Measurable functions. Integration, and convergence theorems.

PM303 Advanced Calculus A (two credit points) (prerequisite: PM202)
Mappings of Euclidean space, derivaties as linear maps, inverse mapping theorems.

PM304 Advanced Calculus B (two credit points) (prerequisites: PM303 and PM305)
Multilinear algebra. Differential forms. Integration over chains. Fundamental theorem of calculus. Applications to complex calculus.

PM305 Topology (two credit points) (prerequisite: PM202)
Metric spaces, limits,continuity, and completeness. Topological spaces. A discussion of general topological properties.

PM306 Group Theory (two credit points) (prerequisite: PM206)
Jordan-Holder Theorem. Sylow theorems. Soluble groups and nilpotent groups. Permutation groups. Linear groups.

PM307 Rings and Modules (three credit points) (prerequisite: PM206)
Principal ideal domains. Elementary theory of modules, leading to finitely generated modules over a principal ideal domain. Application to abelian groups and linear transformations.

PM308 Fourier Series (three credit points) (prerequisite: PM302)
Convergence of Fourier series. An introduction to some related parts of functional analysis. The Banach-Steinhaus theorem.

PM309 Field Theory (two credit points) (prerequisite: PM206) (This component will not be given in 1973.)
Field extensions, leading to Galois theory.

PM310 Lattice Theory (two credit points) (prerequisite: PM305)
Posets and lattices. Distributive and modular lattices. Ideal and representation theory. Spaces of prime and minimal prime ideals.

PM311 Combinatorial Theory (two credit points) (prerequisite: PM206 provides useful background but is not essential).
Ramsey's theorem. Elementary graph theory. Chromatic polynomials, Polya's enumeration theorem. Block designs.

PM312 Formal Logic B (six credit points) (prerequisite: PM208 or Philosophy IIFA/IIIFA) (This component is identical with Philosophy IIFB/IIIFB).
A study of propositional and predicate logic, by considering some formal systems and their semantics, and an introduction to axiomatic set theory.

PM313 Number Theory (two credit points) (prerequisite: PM206)
Topics to be selected from: Fermat's theorem. Fermat's Last Theorem and related results. Representation of numbers as sums of primes, squares, cubes. Algebraic numbers and algebraic integers. Polynomial congruences. Number theoretic functions. Results involving $\pi(x)$. Riemann zeta function.

PM314 Function of a Complex Variable (two credit points) (prerequisite: PM305)
Cauchy's integral theorem, and other important related results on functions of a complex variable.

PM315 Nonlinear Programming (two credit points) (prerequisite: PM205) (Not available in 1973)
Quadratic and convex programming. Duality. Computational techniques.

PM316 Philosophy of Mathematics (six credit points) (prerequisite: PM208

or Philosophy IIFA/IIIFA) (This component is identical with Philosophy IIPM/IIIPM).
A study of some problems in the foundations of mathematics including a study of the logicist, formalist and intuitionist views, and an examination of some mathematical concepts such as number, set and infinity.

AM301 Methods of Applied Mathematics (five credit points) (prerequisites: AM201, AM202, AM203, PM201 and, after 1973, PM202 and PM203)
Topics selected from: Complex analysis. Hilbert spaces. Differential equations including Sturm-Liouville theory. Green's functions. Calculus of variations. Integral transforms. Distributions and generalized functions.

AM302 Potential Theory (five credit points) (prerequisites: AM201, AM202, AM203, PM201)
Gravitation. Solution of Laplace's equation. Conformal mapping techniques with applications. Irrotational fluid mechanics. Water waves. Electrostatics and magnetostatics.

AM303 Special Relativity Theory (two credit points) (prerequisites: Mathematics IB and AM204)
Lorentz transformation. Minkowski space-time, space-time, particle kinematics and ray optics, mechanics of a particle, Maxwell field.

AM304 Three-dimensional Dynamics (two credit points) (prerequisites: AM202, AM204)
Rotating co-ordinate systems. Rigid body motion. Variational principles. Small vibrations.

AM305 Introduction to Quantum Mechanics (four credit points) (prerequisites: AM204, AM301)
Hamiltonian systems. Vector spaces and linear operators, wave functions and wave equations. Angular momentum. Perturbation theory. Scattering.

AM306 Electromagnetic Theory (two credit points) (prerequisites: AM302, AM303)
Steady fields and currents. Maxwell's equations. Plane waves. Radiation.

AM307 Elasticity (two credit points) (prerequisites: AM201, AM202, AM203, PM201, PM202, PM203) Not available in 1973
Stress and strain quadrics. Compatibility conditions. Navier equation in Isotropic media and boundary value problems.

AM308 Numerical Analysis (two credit points) (prerequisites: AM205, PM201, PM203)
Topics selected from: Calculation of eigenvalues and eigenvectors of symmetric matrices. Matrix norms. Perturbation theory. Error analysis.

Iterative methods. Approximation of functions. Solution of partial differential equations.

AM309 Introduction to Computer Science (two credit points) (prerequisite: AM205 provides useful background but is not essential)
Computer hardware. Boolean algebra. Computer logic and arithmetic Storage. Machine languages. Compilers and supervisors.

ST301 Techniques of Mathematical Statistics (four credit points) (prerequisite: ST201)
Transformations in one and many dimensions, derivation and sampling distributions for t and F; characteristic functions, inversion and uniqueness theorems, continuity theorems, leading to the central limit theorem and the weak law of large numbers; the multivariate normal distribution, order statistics and the elements of non-parametric methods.

ST302 Inference (four credit points) (prerequisite: ST301, ST202)
Estimation, concepts of sufficiency and maximum likelihood, confidence intervals, hypothesis testing, the Neyman-Pearson lemma, asymptotic methods, Bayes methods.

ST303 Linear Hypothesis Theory (four credit points) (prerequisites: ST203, ST301, ST302)
A general treatment, using the multivariate normal distribution of problems of estimation and hypothesis testing with linear models.

ST304 Non-parametric Methods (two credit points) (prerequisite: ST302)
Order statistics, sample distribution function, Glivenko-Cantelli theorem, Kolmogorov's statistic and test, Wilcoxon's statistic and test. Sign test, run test. Non-parametric confidence intervals.

ST305 Sequential Analysis (two credit points) (prerequisites: ST301, ST302)
Wald's lemma and identity; the sequential probability ratio test and its properties. Other sequential procedures. Sequential estimation and fixed-width confidence intervals.

ST306 Sampling Theory (two credit points) (odd-numbered years only. This component is identical to ST206)
Methods of analysis of sample surveys; simple random sampling; cluster sampling, stratified sampling.

ST307 Stochastic Processes (four credit points) (prerequisite: ST201, ST207)
Waiting times, 0-1 laws, recurrent events, Markov chains, simple time-dependent stochastic processes.

ST308 Operations Research (three credit points) (prerequisite: ST202) Optimization problems, including linear programming and allocation and sequencing problems, applications of the theory of games; introduction to queuing theory; critical path analysis, inventory and replacement.

Class Requirements: Class requirements will be given to the student at the beginning of and during the year. Tutorials or practice classes, as arranged for each component. Regular written exercises in each component.

Examination Requirements: About three 3-hour written papers in each subject; the number may vary according to the components chosen. Shorter papers may be set and tests held throughout the year.

MATHEMATICS IV – HONOURS COURSES

A student wishing to enrol in the subject Mathematics IV should apply to the chairman of the Department of Mathematics as soon as the results of his third-year examinations are known, and if his enrolment is accepted will select his choice of components in conjunction with the chairman. Each student doing most of his work in pure or applied mathematics will be expected to take five components. In addition to his work in these components, each student will be required to write a thesis which will be taken into account in his final assessment.

Students whose main interest is in pure mathematics should normally have a grade of B or better in Pure Mathematics III. They are also advised to take more than 18 credit points of pure mathematics in third year. Applied mathematics, mathematical statistics and philosophy are recommended as suitable complementary third-year subjects: however other choices are possible.

Students whose main interest is in applied mathematics should normally have a grade of B or better in Applied Mathematics III. Pure mathematics, mathematical statistics and physics are recommended as suitable complementary subjects at third-year level.

Students whose main interest is in mathematical statistics should normally have a grade B or better in Mathematical Statistics III. They are also strongly advised to take Pure Mathematics III, including the component PM302.

Students wishing to combine components from two or more divisions in Mathematics may select components, for which they have the appropriate prerequisites, subject to the approval of the chairman.

The components offered in fourth-year mathematics are listed below: the department reserves the right to withdraw any component in which

insufficient interest is shown, or to offer further components. Fourth-year students wishing to take mathematical statistics components should arrange their courses in consultation with staff members of the statistics division. With the permission of the mathematics and physics departments fourth-year students may take some components in physics.

In special cases prerequisites may be waived by the chairman of the Mathematics Department.

PM401 Group Theory (prerequisite: PM306)
Transfer and fusion. Groups of prime power order. Character theory: orthogonality relations, induced characters, T.I. sets, application to Frobenius groups.

PM402 Differentiable Manifolds (prerequisites: PM303, PM305)
Selected topics from differential topology and differential geometry.

PM403 Noncommutative Rings (prerequisite: PM307)
Selected topics from the theory of Noncommutative Rings.

PM404 Advanced Topics in Nonlinear Programming (prerequisite: PM315)
Symmetric and Self Duality. Integer and Geometric Programming. Computational Techniques. Programming in Complex Space.

PM405 Functional Analysis (prerequisite: PM308)
Integral representation theory. Locally convex topological vector spaces and the Hahn-Banach Theorem. Duality Theory. The Stone- Weierstrass Theorem. Banach algebras.

PM406 Topics in Algebraic Topology (prerequisites: PM206, PM305)
Simplexes. Simplical complexes. Invariance of the homology groups. Homotopy theory.

PM407 Advanced Topics in Complex Analysis (prerequisite: PM314 or AM301) (Not available in 1973)
Topics in conformal mapping, Riemann mapping theorem, harmonic functions, Dirichlet problem.

PM408 Game Theory (prerequisite: PM205)
Two person non-zero sum games, n-person games, infinite games.

PM409 Lattice Groups (prerequisite: PM310)
Lattice groups and vector lattices, prime and minimal-prime ideals. Values. Representation theory.

PM410 Semigroups (prerequisite: PM310)
Introduction to semigroups, Ideals, congruences, Green's relations. The lattice of congruences of a completely o-simple semigroup.

PM411 Mathematical Logic (prerequisite: PM312 or Philosophy IIFB/

IIIFB) (This component is identical with the mathematical logic component in Philosophy IV).
Metatheory for classical first-order and second-order quantificational logic. Philosophy of mathematics.

PM412 Universal Algebra (This component will not be given in 1973)
Ordered sets. Categories. Closure systems. Lattices. Subalgebras. Congruences. Free algebras. Varieties.

PM413 Commutative Algebra (prerequisite: PM307)
Modules over commutative rings. Rings and modules of fractions. Tensor products. Primary decomposition of rings. Noetherian and Artinian rings. Integral dependence. Dedekind domains.

AM401 Mathematical Methods (prerequisite: AM301)
Topics selected from: generalized functions. Asymptotic methods. Integral transforms. Integral equations. Applications of functional analysis. Special functions. Lie groups.

AM402 Continuum Mechanics (prerequisites: AM301, AM302)
Topics selected from: Motion of Newtonian fluid. Boundary layer theory. Lubrication theory. Hydrodynamic stability. Compressible flow. Elasticity.

AM403 General Relativity (prerequisites: AM301, AM303)
Tensor analysis, Riemannian geometry, Einstein's theory of gravitation, Schwarzchild's solution, gravitational red-shift, perhihelion advance, bending of light ray, cosmological models.

AM404 Analytical Mechanics (prerequisites: AM301, AM304)
Hamiltonian systems, global dynamics, transformation theory, stability and perturbation theory.

AM405 Quantum Mechanics (prerequisites: AM301, AM303, AM305)
Advanced quantum field theory and quantum electodynamics.

AM406 Electromagnetism (prerequisites: AM301, AM302, AM303, AM 306)
Maxwell's equations; polarization; wave guides; radiation from point charge.

AM407 Astrophysics (prerequisites: AM301, AM302) Not available in 1973
Simple stellar models. Small oscillations. Stability.

AM408 Numerical Analysis (prerequisites: AM301, AM308)
Projection methods. Iterative methods. Order of convergence. Error analysis. Application of elementary functional analysis to numerical analysis.

AM409 Statistical Mechanics (prerequisite: AM301, AM305)
Maxwell-Boltzmann statistics, ideal gas, quantum statistics, thermodynamics, specific heats.

ST401 Probability Theory (prerequisite PM302)
Probability theory as a part of measure theory. Standard theorems and techniques.

ST402 Probability Theory II (prerequisite ST401)
Continuation of ST401 to more specialized topics.

ST403 Inference
Advanced estimation theory and hypothesis testing.

ST404 Multivariate Analysis (prerequisite ST303)
Estimation and hypothesis testing with the multivariate normal distribution. Generalized analysis of variance.

ST405 Time Series
Introduction to spectral theory; estimation and hypothesis testing in time series.

ST406 Operations Research (prerequisite ST308)
Advanced topics in inventory, optimization procedures, game theory, network and flow theory.

ST407 Stochastic Processes (prerequisite ST307)
Markov processes, diffusion processes, branching processes, renewal theory.

ST408 Game and Decision Theory
An introduction to decision theory and its relation to game theory.

ST409 Distribution Theory (prerequisite ST401)
The algebra of distribution functions. Infinitely divisible, stable and associated laws.

ST410 Sequential Analysis (prerequisite ST305)
Theoretical approach to sequential analysis using stopping rules.

ST411 Non-parametric Analysis (prerequisite ST304)
Inference with unknown distributions; distribution free tests, theory of rank tests.

Preliminary reading, prescribed reading and class and examination requirements in Mathematics IV will be given to the student at the beginning of and during the year.

POSTGRADUATE STUDIES

Qualified candidates will be accepted for the degree of MA, M Sc and

Ph D in a number of branches of mathematics. More detailed information can be obtained from the chairman of the Mathematics Department. Research interests of members of the department comprise abstract algebra, including group theory and ring theory, lattice-ordered groups, combinatorial theory, mathematical programming, functional analysis, topology, approximation theory, differential equations, numerical methods, computing, astrophysics, fluid mechanics, hydrodynamic stability, statistical mechanics, quantum mechanics, symmetry algebras, general relativity, electrochemistry, electromagnetism, probability theory, statistical analysis of stochastic processes, mathematical ecology, regression, mathematical epidemiology.

PHILOSOPHY

For details see the volume of the handbook containing disciplines offered by the School of Humanities.

PHYSICAL SCIENCES

PHYSICAL SCIENCES IT

This is a one-year terminal course in physical sciences and consists of components from mathematics and physics.

As distinct from Physical Sciences II and III, Physical Sciences IT is not available to students enrolled in the School of Physical Sciences. It is a combination of mathematics and physics.

Prerequisites: Although a knowledge of physics and mathematics to higher school certificate level is desirable, a student who has obtained a good pass at leaving level would be accepted. In such cases the preliminary reading suggested should be carefully studied.

Preliminary Reading

Courant. R. and Robbins, H. *What is Mathematics?* Oxford Univ. Pr.

Selected topics from one or other of the following books:

Messell, H. ed. *Modern Introduction to Physics* Vols 1 and II Horwitz and Graham

Physical Sciences Study Committee *Physics* Heath & Co

Mathematics Component

Differentiation and integration of simple algebraic and trigonometric functions. Taylor series (expansion of algebraic, trigonometric and exponential functions). Partial differentiation. Definition and elementary properties of complex numbers. Graphical representation and the complex exponential functions. Addition and multiplication of vectors. The gradient of scalar functions and also the Laplace equation. Simple differential equations.
(These courses will be taken from existing IA and IC courses depending on the students' background prior to university entrance.)

Physics Component (36 lectures plus one term laboratory)

PH110 Environmental Physics (21 lectures)
The states of matter, solids, liquid gases. Stress and strain, elasticity. Hydrostatics, fluid dynamics, viscosity, Stokes law, and terminal velocity. Electromagnetic spectrum, Kirchoff's Stefan-Boltzmann and Wien's laws. Planck's distribution and quantum theory of radiation. The solar spectrum and solar constant. Radiation observed at the ground. Temperature, pressure, gas laws, heat and work laws of thermodynamics. Thermodynamics. Thermal stresses. Heat conduction and convention. Physical environment of the biosphere. Energy balance at a surface e.g. earth, animal or plant. Modern physics. Radioactivity, X-rays, elementary particles, nuclear physics.

PH111 Electrical Circuit Theory (15 lectures)
D.C. Circuits: Resistances in series and parallel; Kirchoff and Thevenin theorems. A.C. Circuits: Sinusoidal voltage and current. Resistive load, instantaneous power, average power, differential properties of R, L and C, Phaser concept. L, LC, LRC circuits, and associated properties. P-N junctions.

Class Requirements: Approximately three lectures a week for three terms. Tutorial classes each week in physics and mathematics and one term of physics laboratory work in electronics.

Examination Requirements: Two 3-hour written papers, or equivalent.

PHYSICAL SCIENCES II AND III

Physical Sciences II and III are subjects which can be made up of components of any physical science subject, with the provision that the same component cannot be counted as part of two subjects. The work value of the segments must total at least 12 units in second year and 18

units in third year. The units chosen must be recorded by the adviser of studies in physics as well as all subsequent changes.

PHYSICAL SCIENCES II

Segments from second-year subjects which may be included in Physical Sciences II can be chosen from the following, and the total work value must be at least 12 credit points.

Chemistry

Inorganic Chemistry IIB, Organic Chemistry II and Physical Chemistry IIA. Each may be taken singly or in combination provided that chemistry is not taken as a major subject at the second-year level. The prerequisite for each is Chemistry I and each has a work value of four credit-points.

Geology

Crystal optics may be taken by itself *or* crystal optics together with igneous petrology or metamorphic petrology or sedimentology may be taken for six credit points.

Mathematics

A student who has passed in Mathematics IA and IB may take any second-year mathematics component, while a student who has passed in Mathematics IA only, may take components from the following: PM 201, PM203, PM205, PM208, PM210, AM 202, AM205, and any statistics components from ST201 to ST207. Advice on the choice of components may be obtained from the chairman of the Department of Mathematics.

Physics

Second-year physics components may be chosen in one of the following ways:

1. Four credit points from PH201 to PH207, together with two laboratory courses.
2. Six credit points from PH201 to PH207, together with three laboratory courses.
3. Eight credit points from PH201 to PH207, together with four laboratory courses.

Students must discuss their choice of components in physics with one of the advisers of studies in physics.

PHYSICAL SCIENCES III

Segments from third-year subjects which may be included in Physical Sciences III can be chosen from the following; and the total work value must be at least eighteen credit points.

Chemistry

Inorganic Chemistry IIIB, Organic Chemistry III, and Physical Chemistry III. Each may be chosen singly or in combination provided that chemistry is not being taken as a major subject at the third-year level. The prerequisite for each is the appropriate course from Chemistry IIA or, in special cases IIB and each has a work value of six credit points.

Students should note that the completion of sections of the chemistry courses in Physical Sciences III does not qualify them for admission to the honours school of chemistry. However, in every case, intending honours students should make application to the head of the appropriate division of chemistry.

Mathematics

Students may choose those components of Pure Mathematics III, Applied Mathematics III and Mathematical Statistics III for which they have the prerequisites listed under these subjects in this handbook. Advice on the choice of components may be obtained from the chairman of the Department of Mathematics.

Physics

Third-year physics components may be chosen in one of the following ways:

1. Two credit points from PH301 to PH308 and one laboratory credit point (three points).
2. Four credit points from PH301 to PH308 and two laboratory credit points (six points).
3. Six credit points from PH301 to PH308 and three laboratory credit points (nine points).
4. Eight credit points from PH301 to PH308 and four laboratory credit points (twelve points).

Alternatively, students enrolled in Physics IIIA may choose components from Physics IIIB together with mathematics or chemistry components to meet the requirements for Physical Sciences III.

Students must discuss their choice of components in physics with the physics adviser of studies.

In special circumstances students may be permitted to take only theoretical components from Physics IIIA.

PHYSICS

A student majoring in physics for the B Sc degree takes the sequence Physics I, Physics II, Physics IIIA. A mathematics subject is required in first and second year to proceed to the next year and Applied Mathematics III is recommended as the second subject in third year for those students intending to go on to Physics IV for an Honours B Sc degree.

Physics IIIB is intended to give a broader view of physics and can only be taken with Physics IIIA.

PHYSICS I

Physics I courses will be conducted on the assumption that students have reached a standard in physics and in mathematics equivalent to that of higher school certificate level.

SYLLABUS

PH101 Electrical Circuit Theory

D.C. circuits: resistances in series and parallel; circuit theorems (Kirchoff, Thevenin, Norton, maximum power transfer) and circuit analysis; measuring instruments and circuits. A.C. Circuits; sinusoidal voltage and current. Resistive load, instantaneous power, average power, properties of R, L and C; transformer, vector representation and complex notation; measuring bridge and the C.R.O. LCR circuits and associated properties (frequency response, filters, resonance, transients).

PH102 Mathematical Introduction

Differential and integral calculus (physicist's viewpoint). Vector algebra. Complex numbers. Errors. Distributions, physical quantities and dimensions. Linear differential equations. Kinematics.

PH103 Wave and Field Propagation

General wave phenomena and their inter-relationships. Superposition of waves (interference, diffraction) and its applications to mechanical, sound and electromagnetic waves. Geometrical optics.

PH104 Electricity and Magnetism

Coulomb's law; Lorentz force relation; electron motion in uniform electric and magnetic fields; Law of Biot and Savart; Ampere's Law; Gauss's Law;

calculation of simple electric and magnetic field configurations; dielectrics; capacitance; induction effects.

PH105 Mechanics and Special Relativity

Accelerated frames. Energy. Gravitation. Simple harmonic motion. Rotational kinematics and dynamics. Special relativity theory. Lorentz Fitzgerald contraction. Time dilation. Variation of mass with velocity. Energy. Photons.

PH106 Modern Physics

Brief historical introduction. De Broglie relationships. Wave particle dualism. Electrons as waves. Electron diffraction. Wave packets. Phase and group velocities. Heisenberg's uncertainty principle, the wave equation. Characteristics of X-rays (production, theory).

PH151, PH152, PH153

A three-term introductory course in electronic measurement techniques.

Class Requirements: Lectures – three a week for three terms. Tutorials – one a week for three terms. Laboratory – four hours a week for three terms.

Examination Requirements: Each unit course, as outlined above, will be examined either at the end of term or at the end of the year as appropriate The laboratory work of each student is assessed continually throughout the year and is taken into account in the final results.

Preliminary Reading

Physical Science Study Committee *Physics* 2nd rev. edn, Heath 1965

OR

Stollberg, R. and Hill, F.F. *Physics: Fundamentals and Frontiers* Arnold 1966

Prescribed Reading: Many texts for first year physics are available and most would cover the course satisfactorily. Those which will be used by the lecturers are given below and the student should choose whichever is more attractive.

EITHER

Alonso M. and Finn, E.J. *Physics* Addison-Wesley 1970

OR

Beuche, F. *Introduction to Physics for Scientists and Engineers* McGraw-Hill

PHYSICS II

Prerequisites: Students enrolling in any portion of this subject will

normally be expected to have completed the Physics I course and Mathematics IA or Mathematics IB.

SYLLABUS (12 credit points constitute Physics II)

PH201 Physical Electronics (one credit point)

Conduction in solids; intrinsic and extrinsic semi-conductors; pn junction; diode circuit applications; junction transistor; transistor configurations; transistor biasing, hybrid model; analysis of amplifier circuits; vacuum diode, triode, pentode.

PH202 Physical Optics (one credit point)

Description, production and analysis of polarized light; Jones matrices. Geometrical optics; thick lenses.

PH203 Classical Mechanics and Relativity (two credit points)

Generalised co-ordinates, velocities and momenta, Lagrangian function and Lagrange's equation. Conservation laws. Central field; collision problems; systems of particles. Conservation systems. Hamiltonian function and Hamilton's equation. Poisson bracket. Rigid-body dynamics; Inertia tensor, Minkowski's space-time; geometric representation of space time. Four-vector formulation of special relativity; four-velocity, four momenta, four-force. Transformation of dynamic quantities. Relativity and electromagnetism.

PH204 Thermodynamics (two credit points)

Classical thermodynamics with applications to low temperature physics.

PH205 Quantum Mechanics (two credit points)

Magnitudes of physical quantities in quantum mechanics. Uncertainty principle. Fourier transforms. Schroedinger equation. Barrier-well problems. Harmonic oscillator. Average values in Q.M. Legendre, Laguerre introductory matrix mechanics.

PH206 Solid State Physics (one credit point)

Crystal structure, crystal diffraction, elastic constants and elastic waves, phonons and lattice vibrations.

PH207 Electromagnetic Theory (two credit points)

Mathematical preparation, Maxwell's equations in differential form, method of solution in Laplace's equation, the wave equation and electrodynamic potentials.

PH208 Fluid Dynamics (one credit point)

Equation of continuity. Particle rates of change and local rates of change. Streamlines. Euler's equation of motion. Bernoulli's equation, three-dimensional potential flow. Circulation. Some potential theorems. Stream

function and two-dimensional flow. Viscous flow; the Navier-Stokes equation for viscous incompressible flow. Poiseuille's law. Stokes' formula

PH251, PH252, PH253, PH254, PH255, PH256: Associated laboratory courses, credit for these is included in the above theory courses.

Class Requirements: Lectures – four a week for three terms. Laboratory – four hours a week for three terms.

Examination Requirements: Each unit course as outlined above will be examined either at the end of term and at the end of the year. The laboratory work of each student is assessed continually throughout the year and is taken into account in the final result.

Preliminary Reading: See prescribed reading for Physics I.

Prescribed Reading

Lorrain and Corson *Electromagnetic Fields and Waves* 2nd edn, Freeman 1970

Leighton, R.B. *Principles of Modern Physics* McGraw-Hill, Paperback 1959

Kittel, C. *Introduction to Solid State Physics* 3rd edn, Wiley

Pippard, A.B. *Classical Thermodynamics* Cambridge 1966

Millman and Halkias *Electronic Devices and Circuits* McGraw-Hill 1967

Landau and Lifshitz *Mechanics* Addison-Wesley 1960

PHYSICS IIIA

Students intending to continue to honours physics are advised to enrol in a third year mathematics unit as their other third year subject. The following mathematics units are considered to be useful for a continuing study of physics: PM301, 308, 314; AM301, 302, 304, 305.

No quantum mechanics is taught in Physics IIIA and it is recommended that students take AM305 to provide the necessary background for Physics IV.

Students interested in a more mathematical approach at third year should consider enrolling in Physical Sciences III. In special circumstances students may be allowed to take only theoretical components of Physics IIIA.

Prerequisites: A student enrolling in this subject will be expected to have completed the Physics II course and one of the second-year courses in mathematics.

SYLLABUS (18 credit points constitute Physics IIIA)

PH302 Electronics (one credit point)

FET's and MOSFET's; feedback amplifiers, properties of negative feedback

and stability; sinusoidal oscillators; relaxation oscillators; constant-K and m-derived circuits.

PH303 Electromagnetic Theory (two credit points)

Maxwell's equations and e.m. waves in vacuo matter. Retarded and Hertz polarization potentials. Poynting's theorem. Application of Maxwells equations; transmission lines, wave guides, cavities and aerials, accelerated charges, scattering and dispersion. Electromagnetism, special relativity and quantum theory.

PH304 Nuclear Physics (two credit points)

Introduction (forces, terminology and units, angular momentum, cross-section Rutherford scattering). Mass and binding energy. Semi-empirical mass formula and nuclear stability. Nuclear decay and parity. I-spin. Independent particle model. Single-particle shell model. Configuration mixing and intermediate coupling. Collective model. Single-particle states in a deformed potential.

PH305 Statistical Mechanics (two credit points)

Quantum statistical mechanics. Statistical description of ensembles of a large number of particles and its application to metals, gases and He^4.

PH306 Optics (one credit point)

Reflection from dielectric and metallic surfaces, and thin films. Introduction to laser physics.

PH307 Solid State Physics (two credit points)

Free electron Fermi gases. energy bands in solids. Semiconductor materials and transport properties of semiconductors.

Ph308 Atomic Physics and Spectroscopy (two credit points)

Vector model of the atom, spectral states. Perturbation theory. Selection rules. Atoms in magnetic fields. Complex spectra. Introduction to molecular spectra.

Laboratory Courses

PH351, PH352, PH353, PH354, PH355 and PH356 – each one credit point.

Class Requirements: Lectures – four a week for three terms. Laboratory – eight hours a week for three terms.

Examination Requirements: Four 3-hour papers. The laboratory work of each student is assessed continually throughout the year and is taken into account in determining the overall performance of the student.

Preliminary Reading: See prescribed reading for second year.

PHYSICS IIIB

The course is a terminal course and only taken with Physics IIIA. The course is designed to provide a broader and less theoretical view of the recent achievements and techniques of physics.

In special circumstances students who complete Physics IIIB may be permitted to enrol in Physics IV.

SYLLABUS: (18 credit points constitute Physics IIIB.)

PH310 Experimental Methods (four credit points)
Specialised electronic techniques, digital circuits, elementary computer logic vacuum systems, vacuum technology.

PH311 Physics of the Earth (four credit points)
Seismology or wave propagation in the earth, solar and terrestial relationships, geophysics.

PH312 Physics of Materials (four credit points)
Low temperature phenomena, liquid helium, first and second sound, superconductivity, magnetic resonance, electron emission from solids, work functions, photoelectron spectroscopy.

Class Requirements: Lectures and reading courses as arranged. Four hours a week for three terms. Laboratory – eight hours a week for three terms.

Laboratory: Laboratory work consists of projects supervised by a member of staff. Six credit points of laboratory are available.

Examination Requirements: Performance in the course will be assessed either by examination or during the year as determined.

PHYSICS IV

Prerequisites: A student enrolling in this subject will be expected to have completed the Physics IIIA course. Admission to this course is at the discretion of the chairman of the department. The course consists of 20 credit points selected from the following.

SYLLABUS

PH401 Mathematical Physics and Statistical Mechanics (three credit points)
Use of Green's functions in the Many-Body problem. Feynman Diagrams. Quasi-particles. Dyson's equation approximations. Applications to superconductivity, electron gas in metals, superfluids. Liquid state.

PH402 Elementary Particles Physics (one credit point)
Interactions. The particles (graviton, photon, neutrinos, muons, pions,

other mesons, hyperons, baryon resonances, meson resonances, anti-particles). Classifications.

PH403 Nuclear Physics (one credit point)
Nuclear reactions. The compound nucleus. Resonant reactions. Optical model. Direct reactions, isobaric analog states.

PH404 Quantum Mechanics (three credit points)
Relativistic quantum mechanics, Klein-Gordon equation. Dirac equation, field quantisations, Feynman diagrams.

PH405 Solid State Physics (two credit points)
Diamagnetism. Paramagnetism. Fero, ferri, and antiferromagnetism. Magnetic resonance.

PH406 Relativity (two credit points)
Tensors. Einstein's gravitational equations. Schwarzchild space-time. Three tests of gravitation theory.

PH407 Special Relativity (one credit point)
A detailed look at the application of the special theory to one branch of physics.

PH408 Scattering Theory (one credit point)
Classical theory of scattering, and the conditions of validity. Differential and total collision cross-sections. Quantum theory of scattering; particle wave analysis; phase-shift calculations; scattering by central field; the Born approximation.

PH409 Plasma Physics (one credit point)
Motion of charged particles in force fields. Macroscopic motion of plasma in force fields. Waves in a plasma.

PH410 Ionization Physics (one credit point)
The properties of weakly ionized gases. Interaction of charged particles with surfaces. Electrical breakdown of gases.

Options: Certain units in advanced mathematics courses may be taken in place of some of the units listed above. Any such interchange must be approved by the chairman of the department.

Project: Students are required to choose either an experimental or theoretical project-area, which shall carry 25 per cent of the total assessment for the year (5 credit points).
Students who choose the theoretical option shall be required to take three additional lecture courses (theory of kinetic equations, group theory in physics and magnetohydrodynamics), and to undertake a small theoretical project. This is the equivalent of 5 credit points.

Class Requirements: Lectures – eight a week till completed. Project – 16 hours a week for two terms.

Examination Requirements: Up to eight 3-hour papers. However, it is anticipated that a number of lecture courses and project areas will be assessed or examined during the course of the year.

POSTGRADUATE STUDIES

Postgraduate studies and research are conducted in the divisions of physics of which there are at present two. Entry qualifications are a good honours degree in physics, theoretical physics, applied mathematics, physical chemistry, molecular science or any other related subject. Students may proceed to the degree of M Sc or Ph D.

Division of Electron Physics (Professor D.E. Davies)

Ionization phenomena in pure gases with particular reference to a study of the plasma/surface interface. Solid state collision phenomena studies by means of electron, photon and ion induced electron emission. Photoelectron spectroscopy. Electron spin resonance, nuclear spin resonance and laser interferometry of solid surfaces.

Division of Theoretical and Space Physics (Professor K.D. Cole)

Theoretical: Theory of the earth's ionosphere and magnetosphere. General relativity. Statistical mechanics, theory of liquids. Molecular quantum mechanics.

Experimental: Studies relating to the properties of the ionosphere and magnetosphere using radio and optical techniques. Auroral physics. Solar-terrestrial relations.

The division of theoretical and space physics operates a field station in Kilmore Shire and encourages collaborative projects with outside agencies.

PSYCHOLOGY

PSYCHOLOGY I (full unit)

Mr R.B. Montgomery

The course is concerned with the study of motivation, with particular

emphasis on love and aggression. The study of these two themes will be used to introduce the student to the areas of biological bases of behaviour, development, drive and emotion, learning and memory, sensory-motor integration, and abnormal and social behaviour. There will also be a component of the course concerned with experimental procedure, the techniques for collection and analysis of data, and questions of interpretation of data.

Prerequisites: The prerequisites for students enrolling for the B Sc degree are passes in the Victorian higher schools certificate examination or an approved equivalent in chemistry and any one subject from biology, physics or a branch of mathematics. There are no prerequisites for students enrolling for the Bachelor of Arts degree.

Class Requirements: Two one-hour lectures and one three-hour laboratory class a week.

Examination: Assessment will be by written laboratory reports, essays, and by objective tests at the end of each term.

Preliminary Reading

Morris, D. *The Naked Ape* Baylis 1967

Morris, D. *The Human Zoo* Corgi 1971

Prescribed Reading

Harlow, H.F., McGaugh, J.L., and Thompson, R.F. *Psychology* Albion, 1971

Rodger, R.S. *Statistical Reasoning in Psychology* Univ. Tutorial Pr. 1967

Sampson, E.E. *Social Psychology and Contemporary Society* Wiley 1971

Schmaltz, L.W. *Scientific Psychology and Social Concern* Harper and Row 1971

PSYCHOLOGY IIB

Syllabus: The course will look at behaviour from essentially three points of view. These are: the development of behaviour, the psycho-biological bases of behaviour, and the quantification and measurement of behaviour and associated individual differences in behaviour.

However, all areas of behaviour will not be covered but emphasis will be placed on some or all of the following: Cognition; learning and memory; perception; motivation; and social behaviour.

The course will build on and expand upon the issues raised in the Psychology I course. Like this course, Psychology IIB will be laboratory based and to this extent it will deal with the design of experiments and analysis of data.

Prerequisites: Biology IB Psychology I.

Class Requirements: Four one-hour lectures a week, and four hours of laboratory session a week for three terms.

Prescribed Reading

Smith, C.U.M. *The Brain, Towards an Understanding* Faber 1970

Nash, J. *Developmental Psychology* Prentice-Hall 1970

Hays, W.L. *Statistics for Psychologists* Holt, Rinehart and Winston, New York 1963 (Available in paperback)

Edwards, A.L. *Experimental Design in Psychological Research* 4th edn, Holt, Rinehart and Winston, New York 1972

Recommended Reading

Gross, C.G. and Zeigler, H.P. *Readings in Physiological Psychology. Motivation* Harper and Row 1969

Gross, C.G. and Zeigler, H.P. *Readings in Physiological Psychology. Neurophysiology/Sensory Processes* Harper and Row, 1969.

Gross, C.G. and Zeigler, H.P. *Readings in Physiological Psychology, Learning and Memory* Harper and Row 1969

Rodger, R.S. *Statistical Reasoning in Psychology. An Introduction and Guide* University Tutorial Press 1967

Spencer, T.D. and Kass, N. *Perspectives in Child Psychology: Research and Review* McGraw-Hill 1970

Mussen, P.H., Conger, J.J. and Kagan, J. *Readings in Child Development and Personality* 2nd edn Harper and Row 1970

Mussen, P.H. (Ed.) *Carmichael's Manual of Child Psychology* 3rd edn, Wiley 1970 2 vol

Butcher, H.J. *Human Intelligence: Its Nature and Assessment.* London: Methuen, London 1968 (Reprinted 1970, paperback)

Bruner, J.S., Goodnow, J.J. and Austin, G.A. *A Study of Thinking* Wiley, New York 1956

Norman, D.A. *Memory and Attention* Wiley, New York 1969

Neisser, U. *Cognitive Psychology* Appleton-Century-Crofts, New York 1966

And others to be prescribed from time to time.

ZOOLOGY

SECOND AND THIRD-YEAR COURSES

ZOOLOGY II

A course of 50 lectures and associated practicals and excursions, in which animals will be studied at the population level, with emphasis on the environmental and evolutionary aspects of population biology. Subjects of study will include the growth, evolution, regulation, interactions, ecology and distribution of animal populations, together with population dispersion and social ethology.

A course of 25 lectures and associated practicals on the evolution and diversity of anthropods and vertebrates.

Prerequisites: Biology IB and preferably either Mathematics IA or Mathematics IC.

Class Requirements: Three lectures and two 3-hour practical/tutorial classes a week for three terms.

Prescribed Reading: Students should consult the Zoology student adviser at the time of enrolment for the course.

ZOOLOGY III

A course of 25 lectures and associated practicals on the comparative morphology and evolution of nervous, reproductive, excretory, digestive, respiratory, circulatory and skeletal systems of arthropods and vertebrates.

A course of 50 lectures and associated practicals in animal physiology and behaviour. Subjects of study will include cellular structure, proteins and enzymes, membrane biology, cellular bioenergetics and respiration, digestion, respiration, circulation, intermediary metabolism, excretion and osmotic regulation, neurophysiology and sensory physiology, neural integration, the structure and physiology of muscle, principles of endocrinology, reproduction, and ecological physiology. Classical ethology: causation, development and evolution of behaviour. The course includes comparative physiology and insect physiology, but some general principles will be treated with particular reference to vertebrates.

At the end of the first term of the third year, students must select one

of the following courses, which will be held in third term. These courses are:

EITHER

Animal Ecology, in which subjects such as the following will be studied: production ecology, applied ecology (conservation), behavioural ecology, animal dispersal and migration, island biology, biometrics and computer programming, Southeast Australian animal ecology, pest management.

OR

Experimental Physiology, in which subjects such as mammalian reproduction, endocrinology, cell physiology, sensory physiology, and aspects of insect physiology will be studied.

Prerequisites: Zoology II.

Class Requirements: Three lectures and two 3-hour practical/tutorial classes a week for three terms.

Prescribed Reading: Students should consult the Zoology student adviser at the time of enrolment for the course.

HONOURS COURSE

Honours students are required to undertake a special research project, complete prescribed courses of reading, prepare essays on selected topics, and attend and give seminars. There are no formal lectures, and hours of study are unlimited. Students who do not have qualifications in statistics may be required to complete a statistics course during their honours year.

POSTGRADUATE STUDIES – MSc AND PhD

Research is currently in progress in the following fields: speciation on oceanic archipelagos; zoogeography of Pacific insects; zoogeography, conservation, physiological ecology and evolution of SE Australian reptiles; ecology, taxonomy and morphology of insects; population ecology of plant-feeding insects, particularly agricultural pest species; biological, chemical, and integrated control of insect pests; physiological and ultrastructural studies of insect excretion, salt and water regulation, sensory receptors; endocrine control of salt and water metabolism in vertebrates; reproductive biology of dasyurid marsupials.

Prospective students should contact the chairman of the department for further details.

PART VI: TABLE OF SUBJECTS

SCHOOL OF AGRICULTURE

Subject	Code No.
First year	
Agriculture I	630.10
Biology IA	570.11
Chemistry I	540.10
Physical Sciences IT	500.10
Second Year	
Agriculture IIA	630.20
Agriculture IIB	630.21
Agriculture IIC	630.22
Chemistry IIB	540.21
Biology II	
Botany IIB	580.21
Genetics IIB	570.21
Third year	
Agriculture IIIA	630.30
Agriculture IIIB	630.31
Agriculture IIIC	630.32
Fourth year	
Agriculture IVA	630.40
Agriculture IVB	630.41
Agriculture IVC	630.42

SCHOOLS OF BIOLOGICAL AND PHYSICAL SCIENCES

Subject	Code No	Unit Value	Prerequisite Subjects
Biochemistry II	574.24	1	Chemistry I and Biology IA or Biology IB
Biochemistry III	574.30	1	Biochemistry II
Biochemistry IV	574.40	1	Biochemistry III
Biology IA (botany and genetics	570.10	1	Nil[4]
Biology IB (zoology and genetics)	570.11	1	Nil[4]
Botany II	580.20	1	Biology IA and one of Chemistry I, Physics I or a first-year mathematics subject
Botany III	580.30	1	Botany II
Botany IV	580.40	1	Botany III
Chemical Physics III	535.30	2	Applied Mathematics II, Chemistry IIA (Physical) and Physics II
Chemical Physics IV	535.40	–	Chemical Physics III or an approved equivalent
Chemistry I	540.10	1	Nil
Chemistry IIA	540.20	1	Chemistry I, Physics I or first-year mathematics unit (incompatible with Chemistry IIB)
Chemistry IIB	540.21	1	Chemistry I (incompatible subject Chemistry IIA)
Chemistry IIIA	540.30	2	Chemistry IIA (incompatible subject Chemistry IIIB)
Chemistry IIIB	540.31	1	Chemistry IIA[1] (incompatible subject Chemistry IIIA)
Chemistry IV	540.40	–	Chemistry IIIA[3]
Economics I	330.10	1	Nil
Economics IIA (microeconomics)	330.20	1	Economics I
Economics IIB (economic statistics)	330.21	0.5	Economics I, and either Social Sciences IB or a mathematics subject (incompatible subject Mathematical Statistics II)

Subject	Code No	Unit Value	Prerequisite Subjects
Economics IIC (economic history)	330.22	0.5	Economics I
Economics IID	330.23	0.5	Economics I (Economics IIA and Economics IIB, or Economics IIG or Economics IIH must be taken before or in the same year as this half-unit)
Economics IIE (industrial relations)	330.24	0.5	Economics I
Economics IIG (mathematical economics)	330.26	0.5	Economics I, and either a mathematics subject or a good pass in Social Sciences IB (incompatible subject Economics IIH)
Economics IIH (introductory mathematics for economists)	330.27	0.5	Economics I (incompatible subjects Economics IIG and any mathematics subject)
Economics IIJ (business decision-making)	330.28	0.5	Economics IIA and Economics IID must be taken before or in the same year.
Economics IIIA (monetary economics and economic policy)	330.30	1	Economics IIA
Economics IIID (economic theory)	330.33	0.5	Economics IIA
Economics IIIG (econometrics)	330.36	0.5	Economics IIB or Mathematical Statistics II
Economics IVE (quantitative economic planning)	330.44	0.5	Social Sciences IIID or a good pass in Economics IIB
Economics IVM (mathematical economics)	300.33	0.5	Economics IIB, or a mathematics subject
Genetics II	570.20	1	Biology IA and Biology IB and at least one physical sciences subject
Genetics III	570.30	1	Genetics II.

Subject	Code No	Unit Value	Prerequisite Subjects
Genetics IV	570.40	1	Genetics III
Geology I	550.10	1	Nil
Geology II	550.20	1	Geology I
Mathematics IA	512.10	1	Nil (incompatible with Mathematics IC)
Mathematics IB	512.11	1	Nil (incompatible with Mathematics IC)
Mathematics IC	512.12	1	Nil (incompatible with Mathematics IA and Mathematics IB)
Applied Mathematics II	515.20	1	Mathematics IA and Mathematics IB
Mathematical Statistics II	519.20	1	Mathematics IA
Pure Mathematics II	510.20	1	Mathematics IA and Mathematics IB
Applied Mathematics III	515.30	1	Applied Mathematics II
Mathematical Statistics III	519.30	1	Mathematical Statistics II, Pure Mathematics II[2]
Pure Mathematics III	510.30	1	Pure Mathematics II
Mathematics IV	510.40	1	Pure Mathematics II and either Applied Mathematics III, Pure Mathematics III or Mathematical Statistics III
Philosophy I	100.10	1	Nil
Philosophy IIFA/IIIFA (Formal Logic A)	100.20/ 100.30	0.5/ 0.33*	Philosophy I or two units from the Schools of Biological or Physical Sciences
Philosophy IISA/IIISA (Philosophy of of Science A	100.21/ 100.31	0.5/ 0.33*	Philosophy I or two units from the Schools of Biological or Physical Sciences
Philosophy IIPM/IIIPM (Philosophy of mathematics)	104.24/ 104.34	0.5/ 0.33*	Philosophy IIFA/IIIFA and a first-year mathematics unit
Philosophy IIFB/IIIFB (Formal Logic B)	103.21/ 103.31	0.5/ 0.33*	Philosophy IIFA/IIIFA
Philosophy IIILA (Philosophical Logic A)	103.32	0.5	Philosophy IIFA/IIIFA

Subject	Code No	Unit Value	Prerequisite Subjects
Philosophy IIILB (Philosophical Logic B)	100.33	0.5	Philosophy IIFA/IIIFA or IISA/IIISA
Philosophy IIISB (Philosophy of Science B)	100.39	0.5	Philosophy IIFA/IIIFA or IISA/IIISA
Philosophy IIIFC (Formal Logic C)	101.32	0.5	Philosophy IIFB/IIIFB
Physical Sciences IT	500.10	1	Nil
Physical Sciences II	500.20	1	As for each segment
Physical Sciences III	500.30	1	As for each segment
Physics I	530.10	1	Nil[1]
Physics II	530.20	1	Physics I, first-year mathematics subject
Physics IIIA	530.30	1	Physics II, second-year mathematics subject
Physics IIIB	530.31	1	Physics II, second-year mathematics subject
Physics IV	530.40	–	Physics IIIA
Psychology I	150.10	1	Chemistry and one of biology, physics, or a branch of mathematics at higher school certificate
Zoology II	590.20	1	Biology IB, and either mathematics IA or Mathematics IC
Zoology III	590.30	1	Zoology II
Zoology IV	590.40	1	Zoology III

* The unit value is 0.5 if presented as part of a second-year unit and is 0.33 if presented as part of a third-year unit

1. In special circumstances, the Board of Studies may accept Chemistry IIB as a prerequisite for Chemistry IIIB.
2. Only for students intending to proceed to honours.
3. Students who have performed well in Chemistry IIIB and another third year science subject may be admitted to the course.
4. For 1974 a pass in H.S.C. Chemistry will be a prerequisite but for 1973, students without such a pass must consult an adviser of studies in the School of Biological Sciences before enrolling in this subject.