Life in Inland Waters

A basic study of animal life in the fresh- and salt-water lakes of south-eastern Australia is providing information relevant to the conservation, management, and use of the continent's limited water resources.

In spite of the critical role of water in the Australian economy, surprisingly little is known about the relation of the chemical composition and physical characteristics (such as temperature and salt content) of our inland waters to the plants and animals that live in them. Dr. W. D. Williams and Dr. I. A. E. Bayly, together with five graduate students, are currently studying the occurrence of crustaceans, molluscs, worms, insects, fish, zooplankton, and other animal life in a cluster of eight lakes near the south-eastern edge of Lake Corangamite in western Victoria. A small field laboratory has been established for on-the-spot investigations.

These particular lakes possess an unusual combination of characteristics that complement those of others studied in the western district. The wide range of salinities found in lakes within a hundred miles of a major university is unique in the world and presents an opportunity to gain a better understanding of our inland waters. As most of the creatures living in Australia's fresh- and salt-water lakes are as unique in their situation as are kangaroos and other marsupials among the world's mammals, the considerable amount of knowledge about the biology of inland waters gained in other countries has only limited relevance to our problems.

In an earlier, introductory study of the fauna of 17 non-marine salt lakes of south-eastern Australia, Dr. Williams and Dr. Bayly found three main types of animals. The first and most plentiful comprised species of fresh-water origin. A second, much smaller group, had originally come from the sea. And one or two land species had adapted to living in lakes.

The presence of the microscopic fresh-water crustaceans, *Boeckella triarticulata*, in several salt lakes was of particular interest. In one, the salinity reached 22.3 parts per thousand—about three times as high as in the most saline water in which that species had previously been found. Further investigation showed that the salt composition differed between those particular lakes and others studied in the region. The water was alkaline and much of the chloride had been replaced by carbonates and bicarbonates. Possibly the carbonate enables this fresh-water species to survive in the presence of otherwise lethal quantities of salt. On the other hand, highly salt-tolerant species such as *Calamoecia citellata* had not invaded these chlorocarbonate waters.

Principles and relations established in such studies are relevant to a wide range of practical problems. For instance, the management of water storages, whether for urban and industrial use, is directed towards maintaining minimum "productivity". The requisite low levels of plant and animal numbers occur in many lakes and an understanding of the mechanisms involved should assist materially in solving water storage problems. Such knowledge can also contribute to pollution prevention; by defining the biological effects of different types and levels of stream and lake contamination, it can provide guidelines for maximum permissible waste-disposal levels.

These investigations in the Monash
Department of Zoology have also raised important questions concerning the evolutionary development of species adapted to saline waters, the mechanisms by which organisms tolerate salinity, and the energy relations of simple ecological systems. Such projects provide an excellent training ground both for those graduates who will remain in basic science and for the much larger number who will be facing important practical problems of conservation, water supply, fisheries management, and pollution as the human population puts increasing pressure on the continent's inland waters in the years ahead.

Computers Serve, Teach . . .

Last year the Monash University Computer Centre trained 500 student programmers and each day handled up to 1,000 separate administrative and research programs.

Its two large digital computers are commercial units with the enormous capacities and speeds we now take for granted. One of them handles half-a-million operations a second and can print 1,000 lines a minute. Associated magnetic units can store 5 million words. The two computers work 24 hours a day, 7 days a week, serving other University Departments and outside bodies including the Universities Victorian Schools Examination Board and the Commonwealth Department of Education and Science.

Some 20% of the work load comprises programming exercises prepared by the hundreds of students taking computer training courses at the Centre. A further 20% of the total computer time is allotted to the University's administrative needs including pay-roll and inventory records, class lists, examination data, and so on.

About half the total computer time is occupied in processing specialist research programs written by staff and graduate students. The subjects range from complex mathematical aspects of nuclear physics to the structure of language.

Books and periodicals are the life-blood of learning and the heart of a university. The Monash library comprises some 340,000 books and subscribes to 7,000 periodicals. Computers are proving invaluable in keeping track of material for student reading and they provide a continuous record of its availability for staff and students.

In addition to the library services already operating, considerable progress has been made with a pilot project for linking all three Victorian university libraries and the State library in a common computer cataloguing program.

If successful, this and similar schemes being developed elsewhere could lead to the establishment of regional bibliographical networks, which might ultimately be linked to important information storage centres throughout the world.

Several special print-outs are available from the computer for Monash library users. For instance, books named for student reading in all the humanities Faculties are listed weekly, with information on their availability, location, the number of copies available and on order, and so on. Monash is the only university in Australia — and one of the few in the world — providing student reading source service at this level.

Although primarily a service rather than a research unit, the Computer Centre has developed systems and programs for special purposes. For instance, the processing of examination data for the Matriculation and Leaving examinations and the marking of Commonwealth Secondary Scholarship papers presented problems that had to be solved before data processing could begin.

The Centre is also collaborating with the Victorian Hospitals and Charities Commission in processing hospital accounts, and with individual hospitals in such administrative tasks as the revision of daily ward lists. Large savings and substantial increases in efficiency have resulted from such computer use by certain Melbourne hospitals.

. . . and Analyse

The digital computers are essentially giant calculating machines, which subtract, add, multiply, and divide numbers.
at fantastically high speeds. But there is another kind of computer that can solve differential equations and hence simulate and analyse complex physical situations represented by them. The analogue computer, as it is called, is a problem-solving rather than a calculating device; it is playing an increasingly important part in solving many complex physical and mathematical problems, and in controlling engineering and processing systems. Since the analogue can simulate real problems in terms of electrical voltages, the engineers, economists, and scientists can "see" the problem as it progresses and modify it as desired.

Because of their specialized use, analogue computers are operated in the relevant university Departments and are not part of the Computer Centre. The Engineering Faculty has nine, most of which are small units for student training. A medium size machine is used by staff and graduate students for various research projects in the Departments of Electrical, Chemical, and Mechanical Engineering.

The important potential role of the analogue computer in some types of modern engineering design is demonstrated to first year students with the help of an automobile suspension system. The various equations involved in its behaviour are represented on an analogue computer. By changing the values for car speed, load, spring stiffness, and so on, the student can see how these variables interact and are reflected in terms of "roadability" as shown by the output curves on the opposite page.

Psychologists Look at Illusion

Although most illusions are of little consequence, others, such as those causing one to underestimate the speed of an approaching motor car or to miscalculate the direction of rotation of an industrial machine, can have serious effects.

Illusions are one aspect of perception — those processes by which man and animals maintain contact with the external world. The study of perception is relevant to many important practical situations, and is basic to the problem of the origins of human behaviour and to a number of mental conditions. Knowledge of the mechanisms of illusion helps us to understand the nature of perception.

Psychologists have found that the human visual system cannot interpret certain properties of the environment without additional information. Some of the essential supplementary facts arrive concurrently with the visual message, through other senses, and some derive from past learning and experience that are kept in store. When the total information available is inadequate or misleading, an illusion occurs and the observer draws incorrect conclusions about the environment.

Professor R. H. Day, Chairman of the Monash Department of Psychology, has made a number of significant contributions to modern knowledge of perception and several graduate students are currently working in his Department on specialized aspects of illusory phenomena. His most recent studies have concerned the processes involved in judgments of orientation.

Apart from clues provided by gravity acting on specialized sensory cells and by features such as the known verticality of a nearby object, judgments of orientation are made in relation to reference axes of the retina of the eye. But the situation is complicated when the body — and eye — is tilted laterally; the specialized parts of the canal systems of the ear then weigh-in with information on the relation of the tilt to the gravitational vertical. However, Professor Day and Dr. N. J. Wade, and others, have shown that other sensory structures, including those associated with the cervical neck joints and with the trunk, are also involved in this highly developed human function of orientation.

Tilted Man

Perception of the vertical changes considerably when people look into an experimental tilted room of the sort depicted below.
The Monash psychologists found that a “tilted vision” effect persisted for as long as 15 minutes after the observer returned to an upright position.

This effect was additional to the shorter-term “spatial after-effect” noted by other researchers and is thought to be an illusion resulting from the “incorrect” learning during exposure to the tilted environment. Such findings have obvious implications for the gravity-free tilted environment of a space capsule.

Another well-known visual illusion is that vertical lines appear longer than horizontal ones of equal length. Miss G. C. Avery and Professor Day have established the basis of this misjudgement. They first disproved a previous, long-held explanation based on the elliptical shape of the normal field of vision by showing that the illusion persisted in darkness when only illuminated lines were visible. They then went on to show that it is the orientation of a line relative to the retina that causes over-estimation of the vertical length. In other words, this particular illusion is due to an inherent structural characteristic of the human eye. If the observer is horizontal, then the horizontal line, not the vertical, appears longer.

It is also well established that the speed of vertically moving objects appears greater than that of those moving at the same speed horizontally. Miss Avery found that this illusion is not, as was thought, simply a result of over-estimating vertical distance. The illusion of faster vertical speed disappeared when observers lay horizontally. Apparently the illusion results from the interaction of impulses from several sources, particularly those from the balancing system of the ear.

Another graduate student in the Department, Mr. T. S. Wong, is studying an illusion involving the upwards or downwards slant of objects with a visually similar horizontal outline. The eye is confused and sometimes sees such objects as slanting downwards and sometimes as upwards. Mr. Wong has achieved “perceptual stability” by providing clues for the eye in the form of surface patterns.

Third Party Law Under Fire

The highways being now both very noisome and tedious to travel in and dangerous to all passengers and carriages.

— preamble to an English statute, 1555 A.D.

An alternative to the present Victorian third party car insurance system is proposed in a thesis submitted for a Master of Laws degree by Mrs. Ann Lahore, a lecturer in the Monash University Faculty of Law.

Following a three-year study of the laws operating in Victoria and elsewhere, she concluded that proof of negligence is not a satisfactory criterion for resolving the claims of road accident victims. Victims must prove negligence and this disqualifies both the vast number injured in accidents in which negligence either does not occur or cannot be established, and drivers involved in one-car accidents. Thus the present law fails to compensate a substantial proportion of those injured.

Criticism of compensation through action for negligence is widespread in many countries. Sir John Barry, a member of the Supreme Court of Victoria, stated recently “Within the field of compensating victims of automobile accidents, it can be asserted with no fear of contradiction that the common law has failed; that the conceptions which the law involves are inadequate and outdated, and that the methods it uses to determine the questions that do arise do no credit to the judges and the legal profession”.

The present Victorian law is placing a tremendous burden on the courts. The Attorney-General stated recently that there was a backlog of some 1,000 accident cases awaiting trial by jury in the Supreme Court. Many more cases are settled out of court, but often only after protracted delay, hardship, and expense for the victims. From the figures available, it appears that legal costs averaged 17.3% of the income from Victorian third-party premiums in 1966-67. This was about twice the cost of all medical and hospital fees incurred by the injured.

The third-party law introduced in Victoria in 1939 improved the present situation by ensuring that finance was available from an insurance fund for victims who could prove negligence; previously damages were often not recoverable because of incapacity to pay. Mrs. Lahore examined the operation of the Act in considerable detail in relation both to cases that went to court and to the manner in which accident victims were compensated through settlements out of court.

Antiquated

She concluded that the negligence action is not a satisfactory method of resolving the claims of road accident victims. The present system of awarding compensation, she says, “is both antiquated and inappropriate”. Critics of the third-party system argue that the law should aim at compensating any person injured, whether or not the injury is caused by another's fault.

After reviewing a number of alternative methods for compensating motor car accident victims, some of which are already in use overseas, Mrs. Lahore outlined a scheme that meets most of the objections raised against them. She envisages a complete overhaul of the present third-party system and abolition of proof of fault as a prerequisite to compensation.

The cost of a system based on proof of loss instead of proof of another's fault would be met by compulsory third party insurance, administered either by the government or by insurance companies. If the cost should prove greater than present third-party premiums can cover, the shortfall could be met by government subsidy possibly raised by such measures as higher fines for traffic offences or increased driving licence fees. In return, everybody in the community would receive fair compensation for road accident victims whether they be drivers, passengers or pedestrians. Mrs. Lahore presented the scheme in considerable detail as an appendix to her thesis.