One of the basic problems in machine design is to couple two rotating shafts so that one may drive the other without any change of speed—even when one of the shafts alters its position in relation to the other. Professor K. H. Hunt, Dean of the Faculty of Engineering at Monash, has now devised a range of novel constant-velocity couplings that solve this problem.

He claims that the new couplings possess marked advantages over existing types and allow—for the first time—the joining of one shaft to a second that shifts sideways, parallel to its original position. They also serve as couplings for intersecting shafts, and all of them can be designed to allow in-and-out, or telescopic, movement. The input and output shafts always rotate at exactly the same speed all the time.

Professor Hunt believes that the couplings would be simpler to manufacture and maintain than many of those now in use.

Many people are familiar with the common 'universal joint' form of shaft coupling; two of them are used in the propeller shafts of most rear-wheel-drive cars. But this joint does not transmit uniform speed between two shafts, and it is only useful when the shafts are nearly in line. Moreover, the universal joint has no inherent telescoping movement, and the car transmission needs a spline as well. When power is to be transmitted through
large angles, a universal joint introduces marked cyclical fluctuations that make it quite unsuitable in many applications. In front-wheel automobile transmission, for instance, shafts have to drive the wheels when they may be turned by the steering through as much as 40°. The development of front-wheel-drive transmissions during the 1930s encouraged the design of constant-velocity shaft couplings, but they are also used in other situations.

Professor Hunt conceived his new designs during an intensive study of the century-old and much neglected 'theory of screws'. This theory enables one to determine, perfectly generally, certain properties of movements available in spatial mechanisms. He found that a feeling for the geometry of 'screw systems' led virtually automatically to an exposure of the geometry of all possible linkage arrangements that satisfy the conditions for constant-velocity transmission. The theory not only accounted for all existing types of coupling, but revealed a large number of completely new ones.

The designs that have emerged consist of linkages arranged in a variety of essentially symmetrical geometrical patterns. The linkages constrain the longitudinal axes of the coupled shafts to intersect one another, irrespective of their relative position or angularity, and the couplings are therefore self-supporting. When the shafts are parallel their axes can be regarded as intersecting at infinity; the symmetry (that characterises all forms of intersecting-shaft couplings) must now be systematically destroyed according to geometric principles that the theory of 'screw systems' clearly dictates. Here a wide range of entirely new self-supporting couplings for parallel shafts emerges.

In general, linkage-based couplings have advantages over the more usual types that incorporate balls rolling and sliding in tracks, with highly localised areas of contact between each ball and its track. These advantages include the potential to transmit greater forces, less susceptibility to wear, easier replacement of components, simpler lubrication and exclusion of dirt, and the avoidance of any complicated profile-machining in their manufacture.

Professor Hunt suggests many fields in which the new couplings may be used. Apart from their use in automobile transmissions, they have potential in agricultural machinery, automatic assembly and processing machinery of many kinds, certain machine tools, control devices and instruments, and many general uses where shaft positions and other settings are subject to frequent adjustment.

EMERGENCY CARE OF ACCIDENT VICTIMS

Waiting times for ambulances, care in hospital casualty departments, and first aid for crash victims have been the focus of considerable attention from both the press and the public in recent years. These and other related aspects of the emergency services provided for road traffic victims in Melbourne have been studied by Dr. G. A. Ryan and Dr. P. D. Clark of the Department of Social and Preventive Medicine at Monash.

In this survey, which was conducted with the assistance of the Victorian Civil Ambulance Service, the investigators were able to attend the scene of a series of one hundred road crashes in the metropolitan area. The sample of crashes studied included pedestrian, motor and pedal cycle, car and truck accidents of all types and with varying degrees of injury to the persons involved. Of the 310 people involved in the crashes studied, four were killed and 20 severely injured.

The study was unique in that the researchers were able to attend the scene of the crash, arriving at or about the same time as the ambulance, and were thus able to document the type and quality of first aid provided for these victims.

In addition to studying care at the scene, the researchers followed the patients throughout their stay in the hospital casualty departments and were thus able to observe and document the emergency care of these victims within the hospital.

No similar study has been conducted previously, either in Australia or overseas. The particular value of this work lies in the fact that an overall picture of the emergency care system can be obtained. The data gathered may be used by ambulance services and hospital authorities to assign priorities in care and improve the efficiency of handling of traffic accident patients.

At the scene, in addition to examining the patients, their injuries and clinical condition, the research team was able to observe the performance of ambulance and other emergency services in such aspects of emergency care as extrication of trapped victims, performance of first aid and co-ordination of emergency services. Additional data were obtained on the time intervals which elapse during the various stages of emergency care, information which has been hitherto unknown for the various services in Australia.

It was found that in 10% of cases the ambulance was at the scene within 5 minutes of the accident and in 75% of cases the ambulance had arrived in less than 15 minutes. The average time from receipt of a call until the ambulance arrived at the scene was 11 minutes. These

Dr. P. D. Clark, of the Monash Department of Social and Preventive Medicine, observing the condition of a traffic accident victim during the Melbourne survey.
times compare very favourably with service times in other countries. The average time taken to transport the patients to hospital was 18 minutes, making a mean time from notification of the accident until arrival in hospital of approximately 30 minutes.

A significant finding was that there were relatively few serious injuries in those involved. Less than 10% of the 310 persons sustained serious injuries and, in general, the care provided by the ambulance personnel was judged to be satisfactory. In no case was the patient’s condition made worse by ambulance treatment and in most cases appropriate treatment was carried out.

After detailed study of these cases at the scene the team was able to conclude that while some changes may be desirable in certain aspects of emergency services operation, the ambulance services in Melbourne are at least as efficient as those provided in other major cities of the world.

The team is currently analysing the results of an intensive study of hospital casualty departments. Findings of this section of the study will be published when they become available.

The tribal languages of the Australian aborigines are dying and unless urgent steps are taken, many of them may be lost forever. The Monash Department of Linguistics has embarked on an urgent programme to study a number that are in immediate danger of extinction.

As many of the fast-disappearing Australian aboriginal tribal languages had never been investigated, the Department, encouraged and supported by the Australian Institute of Aboriginal Studies, undertook an intensive programme to fill in the gaps and clarify the relations between these unique languages, which exist only in verbal form.

In many instances, tribes have scattered and only a handful of people still speak the indigenous language. For example, Mr. Barry Blake, a lecturer in the Department, could find only four members of the Kalkatungu tribe of Western Queensland who still spoke their language, and three of these were over 70 years of age. Other tribes became extinct before any record of their language was made.

Members of the Department have studied the structure, phonetics and vocabulary of several aboriginal languages. These include Kalkatungu (B. J. Blake), Waluwarra (J. G. Breen), Ngarrdji and Djangili (N. Chadwick), Kukuta (J. Platt) and Yukulta (S. Keen).

The continuing Monash programme is playing a major part in an eleven-hour national effort to describe and record the native tribal languages. Modern methods and techniques have provided deeper insight than was possible through earlier studies of other tribes, in which a record of vocabulary was the main object and recording techniques were primitive.

Other activities of the Department include the application of new theories of syntax to sentence building, language problems of German and Spanish migrants, and studies of languages as diverse as Modern Chinese and Ancient Greek.

Meaning before grammar

Following centuries of acceptance of fixed grammatical rules as a basis for written and spoken language, many linguists are now looking at more basic elements, especially those relating to meaning. Sentences may be grammatically correct yet ambiguous. Modern scholars are increasingly concerned with the deeper relationships between meaning and language structure. At Monash, Dr. J. T. Platt has examined the roles played by certain verbs and adjectives in sentences with different kinds of subjects and objects. For instance, in sentences such as ‘Joe——the vase the verbs broke and hated are clearly not interchangeable.

The fact that in an aboriginal language such as Pitjantjatjara verbs like hate, love, and fear have different affixes on their subjects and object than do verbs like break, kill, and make is intriguing and underlines the current interest of linguists in interactions between syntax and meaning.

Accent on German

Leads to improved teaching of German speech to Australian speaking students were obtained by Dr. Heidi Platt as a result of a comparative study of the phonetics of Australian English and German. In a language laboratory investigation, she checked the German speech of students with broad, general, and educated Australian accents. She found that confusion between the Australian and German phonetic systems increased with the intensity of the ‘Australian accent’. However, these differences were not always reflected in the German speech of the Australian students in the manner that would have been predicted from linguistic theory. Small phonetic details often overlooked in such linguistic forecasts were sufficiently strong to confer an ‘unauthentic flavour’ to the learned German. Furthermore, many factors other than phonetic differences interfered with the faithful reproduction of German speech by the Australian students.
The social sciences have been a minor part of Australian education until recently, but have grown rapidly with the establishment of a number of departments, particularly in newer universities such as Monash. One consequence of that development has been an upsurge of interest in the subject in secondary schools.

That interest was highlighted by a UNESCO seminar on the teaching of social science in secondary schools, held at Burwood Teachers College, Melbourne in September, 1967. In turn many other developments have ensued, not the least of which is a curriculum development project in social science education undertaken by Dr. F. J. Hunt and his colleagues in the Faculty of Education at Monash.

Launched late in 1967 with support from the Victorian Education Department and the Myer Foundation, the project was undertaken to work on three major objectives:

- Analyse social science disciplines and identify characteristics which could be used in developing curricula.
- Devise a model or framework for bringing contributions of those disciplines together in an integrated subject that could be taught in schools.
- Identify and examine problems that arise when people work across these disciplines.

The analysis of disciplines and the devising of a model or framework were undertaken with assistance from members of the social science departments. This provided an unusually representative working group and one that could have been formed only at Monash, where each of the main disciplines was represented in a department.

Subsequently, a number of trial units based on the framework were developed and taught in schools. Based on simple acts of behaviour, more complex forms of interactions between people, still more complex forms of activity in which people engage, and the behaviour of people in different types of groups in different spatial and temporal contexts, the units were arranged to provide a sequential and cumulatively developing programme.

The preparation, teaching and evaluation of units in the classroom brought to light a number of obstacles that impede the development of curricula in social science education in Australia. One is the lack of people with expertise in the 'newer' social science disciplines and particularly of those trained in such combinations as economics and anthropology, sociology and geography, or anthropology and biology. A second involves teaching about attitudes and values; this is a most sensitive area and teachers who have considerable professional competence and who are sensitive to issues involved are essential. A third is a need for school social science centres with adequate laboratory resources.

One point of interest is that the experience of working in an interdisciplinary group is stimulating and rewarding, and readily attracts people of considerable competence in their area of specialisation. Possibly this outcome is conditional upon a recognition of the complementary nature of the social sciences and the additional power of an integrated, as distinct from a single-discipline, approach.

The work of the project has been described by Dr. Hunt and several of his colleagues in a paperback, Social Science and the School Curriculum, published earlier this year by Angus and Robertson.

Work is also continuing—this time on a more detailed examination and analysis of inquiry strategies and techniques of the social sciences and involving a review of the role of social science inquiry in society. This new undertaking is being financed by a grant from the Australian Advisory Committee on Research and Development in Education.

PREVIOUS ISSUES

Limited quantities of previous issues of MONASH are still available. The following is a list of subjects covered:

1. New lead on diabetes; Research aids New Guinea education; Design for winds.
2. Saving steel and concrete: Diagnosing physics faculty; Programmed learning pays off; Cigarette smoke under scrutiny.
3. Growth and fertility; Waste into Westport; Tracing demand in business; Migrant language problems.
4. Life in inland waters; Computers—serve, teach; Psychologists look to Utilization; Third Party law under review.
5. Power at half a million volts; Refrigerator features absolute zero; International trade; Students help Aboriginal miners; Joys from an 'exiled' wallaby.
6. Transfer cells in wheat; Hovercraft or beef roads?; Surgeon in Vietnam; New techniques for lecturers.
7. Skin changes monitor sleep; Background to share prices; Cheaper bends for water pipelines; Schools use the computer; Ancient fish, flies and feathers.
8. Music of the Aborigines; Control by fluid power; Novel effluent treatment; Medical centre will be unique; Decoding brain signals.
9. Hepatitis defeat nearer; Relieving wild stresses; Why blackberries are hard to kill; How to learn to feel.
10. A concrete problem solved; Biologists study a suburb; Scale and productivity; Question choice can mislead; Ecology for technologists; Law and credit in Asia.
11. Iodine eliminates endemic cretinism; Progress on diabetes treatment; Quota solution for dairying; Law enforcement unfair to Aborigines; Invention cuts phone echo.
12. Computer helps for hospitals; Mechanics of Swing tissue; Sight and sound from left and right.
13. Academics look at S-E Asia; Noise and the Ibis; Dtsadapt beds; South;(a) Blackwood Hull; Copies—at 25c each—may be ordered from The Information Office, Monash University, Clayton, Vic. 3168. Please enclose 50c stamp for postage.