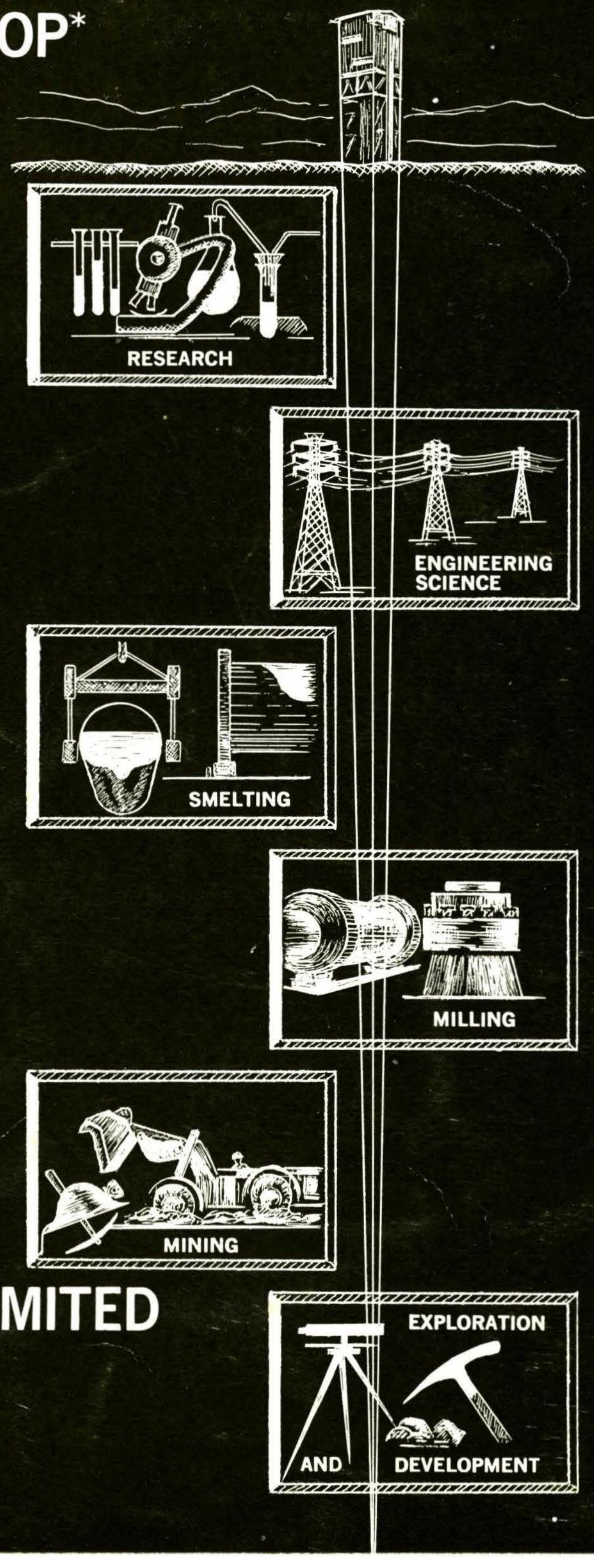
HYSTERESIS 1967

ADELAIDE UNIVERSITY
ENGINEERING SOCIETY



RESEARCH
ENGINEERING SCIENCE
SMELTING
MILLING
MINING
EXPLORATION
AND
DEVELOPMENT

HYSTERESIS
1967

Editors: Andrew Lukasik and Peter Ochota

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EDITORIAL

It is my experience that, in the early years of his course, the engineering undergraduate is not particularly concerned with his commencing salary, either as a graduate or as an experienced engineer. He is generally quite confident that his monetary reward for his four or more years of study shall be quite adequate to meet his conservative demands.

As he nears completion of his course, he finds himself more frequently entertaining pleasant thoughts of the new car he will buy, the overseas trip he has so patiently awaited, or the prospect of investments he shall make.

With this in mind, it seems fitting to discuss the financial state of an engineer, and to put it into its correct perspective.

Ten years ago there were no fixed award rates for members of the Engineering Profession. Although Government Departments did have some policies on the matter, the engineer in private industry was virtually left to the mercy of his employer. It was this undesirable state of affairs which in 1946 instigated the formation of "The Association of Professional Engineers, Australia". Their first major undertaking was to affect arbitration proceedings, resulting in the Professional Engineers Awards and Determinations of 1961 and 1962, which bound all employers with a fixed minimum salary for various grades of engineers.

Since that time there have been many changes in economic circumstances and in the means of determining wages and salaries in Australia, with the result that the A.P.E.A. has sought to reassess the value of, and the awards for, the work done by a professional engineer. Such an assessment should give appropriate weight to the ever-increasing importance of the work and greater professional skill and knowledge required to solve the increasingly complex problems involved in the practice of the profession today.

Much preliminary work has already been done towards this goal, and in the past twelve months a Planning Committee has prepared a framework for the case to be presented to the Commonwealth Conciliation and Arbitration Commission early in 1968. Before the case can actually go to arbitration, the formal procedure is to serve claims to various employers throughout the nation. Such claims were in fact served on 17th August, 1967, to employers throughout Australia in Commonwealth and State Public Services, government and semi-government instrumentalities and authorities in local government and in private industry.

The following is an extract which is of primary interest to students:

> "*A qualified engineer who is not a graduate shall be paid a minimum salary of* $4,500 *per annum and a qualified engineer who is a graduate shall be paid a minimum salary of* $4,960. *Each qualified engineer shall be paid an increment of* $460 *per annum after each completed year of service, provided that an experienced engineer shall be paid a minimum of* $6,800 *per annum.*"

Comparing this with the present commencing annual salary of $3,613 for a graduate engineer, with an annual increment of about $300, the increase is seen to be quite substantial. However, it must be remembered that such a reassessment is not likely to occur for some time, and we anticipate that portion of this increase will be absorbed by inflation within this period.

The engineer as an individual should support bodies such as the A.P.E.A. if he wants to raise the socio-economic status of his profession. The words of Sir Phillip Baxter, as spoken to the Arbitration Commission in 1960, hold an even greater urgency now than they did then:

> *"Australia presents the greatest developmental job that a nation like ours has ever undertaken. Our way of life requires that in doing it we maintain and if possible improve our living standards. There is only one way this can be done, and that is by using all the resources of modern science and technology on a scale never before attempted anywhere in the world. Only in this way can we raise productivity to the level when we can create or buy the capital goods we need at the rate at which we must have them."*

THE DEAN'S PAGE

SOME THOUGHTS ON CONTINUING EDUCATION IN ENGINEERING

by J. L. Woodward (Dean, Faculty of Engineering)

What could be more fitting than for the Dean to discuss the problems of engineering education. Members of the Society will be keenly aware of many problems at the undergraduate level. But I wish to deal instead with the problem of the continuing education of an engineer in professional knowledge and skills beyond the first-degree level.

You will appreciate that educators experience difficulty in fitting essential subject matter into a first degree course of limited duration. Everywhere the trend has been to reduce the time spent on study of the practice of engineering, and to concentrate more on the underlying mathematical and scientific disciplines. Today's graduate engineer is in a better position to understand and apply radically different materials, devices, and systems as they evolve during the course of his professional life, but the important distinction between engineer and scientist has become more blurred at the University level. Fashions change in engineering course structures, but specialisation has generally diminished at undergraduate level, as the scientific core content has increased.

Thus in a period when the scope and diversity of engineering activity has expanded so remarkably, the graduate has become less and less prepared to undertake an immediately-useful role upon entering professional life. It never has been the case that the new graduate was fitted to assume full responsibility in an engineering organisation except at a very junior level. But in the past, preparation for full responsibility could generally be achieved by some form of in-service training, dealing with the aims and structure of the organisation, aspects of the technical plant and processes peculiar to it, and involving periods of experience in the major operating and design divisions. It was necessary to learn unfamiliar techniques but not to master any significant new body of theoretical knowledge. There have of course been exceptions to this general rule, and two notable ones within my own experience were the Advanced Engineering Courses conducted by the British Thompson Houston Company in Rugby, England, and by the General Electric

Company in Schenectady, U.S.A. These courses were aimed however at a relatively small elite group, who were expected to become leaders in fields of engineering research, development, and design.

In English-speaking countries, excepting Great Britain, a bachelor degree course in engineering usually extends over four years, and there is little support for an extension to five or more years to allow the inclusion of specialised material. The need for formal instruction beyond the four-year level is being felt increasingly however, and while no consistent pattern has yet emerged in Australia, the pressures are building up steadily. It should be emphasised that our present higher degree structure at Adelaide, based wholly on research activity, does not fall within the category of advanced instruction to which my remarks are primarily directed.

Formal instruction has long been a major feature of higher degrees in the U.S.A. The proportion of engineering graduates who hold such degrees is also very high. In 1964 the ratio of higher degrees awarded to first degrees was 1:3, and it has been estimated that by 1976 at least one out of two bachelor graduates will go on to a master's degree, and that one in 12 will go on to a doctorate. Following the National Conference on Creative Engineering which was held during 1965 at Woods Hole, Massachusetts, the committee made the following recommendation:

"It is doubtful whether engineering, in this noble sense, can be taught adequately below the graduate level; in any case, the engineering schools should plan and structure their graduate programmes with primary emphasis on the preparation of M.S. and Ph.D. graduates in the art of creative engineering."

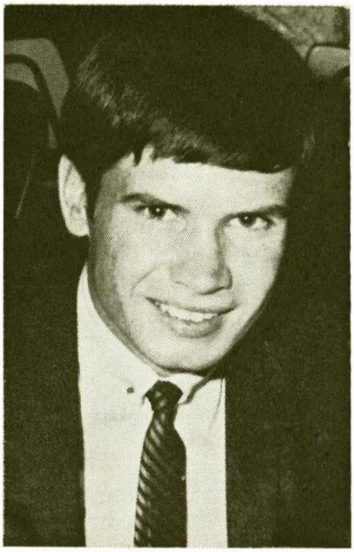
The core curriculum at Cornell University has become so broad that Cornell does not now offer a professional engineering degree at the bachelor level. The first degree with an engineering designation is the Master of Engineering degree awarded after a five-year programme. At the University of California it is proposed that the Master's Degree should succeed the bachelor's degree as the University's first professional engineering degree. It is believed that most of the engineering B.S. graduates will want to embark immediately on the master's degree programme.

One year post-graduate courses consisting largely of formal instruction and leading either to a diploma or an M.Sc. degree are now offered at many of the Universities in Great Britain. The British are far from accepting the American idea however that the master's degree should become the basic professional engineering qualification. Their experience indicates that the students who seem to get most out of the postgraduate courses are those who spend at least one or two years in industry between their first degree and the beginning of advanced training. But the problem of financing such mature students has not yet been fully resolved. Non-doctorate research degrees, usually M.Sc., have been largely displaced by the Ph.D.

Experience of formal course-work higher degrees is still limited in Australia. The research type master's degree continues to command considerable support, and where the course-work degree has been introduced, as at the University of New South Wales, it caters mainly for part-time students. It is my own belief that under Australian conditions the new degree should be aimed at the mature and the part-time student, rather than following on directly from the bachelor's degree work. Engineering Faculties within at least three Australian Universities now offer master's degree courses of this type, but they are very demanding in staff effort and time, and one senses a reluctance to expand this activity while present restrictions on University finance and staffing persist.

Of course "continuing education" must be interpreted broadly enough to include the personal study and reading programme of an individual, and the activities of learned societies in arranging technical addresses and symposia. But there exists nonetheless the need for carefully arranged and supervised lecture or study courses, covering specific areas of engineering theory and practice. Such courses may be promoted and supported by industry, if employers are large and forward-looking. The Residential Schools in Power Supply Engineering, sponsored jointly by the Electric Supply Authorities Association and the Universities of Melbourne and Queensland, have been particularly successful. There have been three such Schools, each of three weeks' duration, and composed of engineers from Supply Authorities throughout Australia. A Residential School of a similar nature was held recently by the Australian Post Office on "Telephone Traffic Engineering". But in rigour and intensity nothing surpasses the three-month courses on "Nuclear Engineering" conducted by the A.A.E.C. at Lucas Heights.

There are undoubtedly some among you whose future lies in commercial or administrative work, and whose cry in later life will be that they never used a half of what they learned at University. Many more however will regret that their lecturers found time to dwell only lightly upon the advanced aspects of some specialised field, and will eagerly seize any opportunity for further tuition.



PRESIDENT'S REPORT 1967

by Bryan Jenkins

A great year for engineers with a great 2-1 win against the Meds. in the Tug o' War, a barbecue which was a screaming success even with court costs deducted, a few new functions such as the Engineering football and a revival with the Golf Day.

The year started with the traditional Freshers' Welcome, where the new students had a chance to see a few of their new pedagogues and be told how much work they must do to pass. Not an inspiring start for the year.

On the social side our first function was the Car Trial. A bit more arduous than last year, with driving tests and more skills involved than in previous years. The success in the planning and running of the trial was due to Bob Burke, and we hope to continue car trials of his standard.

A less serious event in the sporting line was the Staff-Student Golf Day. Although it only moistened the palates of a few, it was a great revival and showed that the staff can be human.

Because of their success last year, the tours to engineering works were run in the May holidays. Speaking from experience, I must say the brewery tour was most enlightening.

Adelaide University kept up their average over the past few years and had two representatives attend the Engineering Symposium in Perth. As we were the closest university to Perth, the organisers were appalled by our massive attendance. The next symposium is in Hobart, and I hope more decide to go, as those who have been will thoroughly recommend them.

It was a memorable day for the engineers when, after five years' drought, they regained the Pam Western Tug o' War trophy. Pulling against great opposition, mainly eggs and rotten fruit, the engineers managed to douse a few Med. students as well as win the event.

A stunt of great ingenuity and planning was pulled off in the first week of lectures when, in the early hours of the morning more than twenty "For Sale" signs were plastered to walls around the campus. Although effectively removed by lunch time, they brought a smile to the face of the Vice-Chancellor.

Second term featured with our main social functions. The barbecue was an overwhelming success with an attendance of nearly a thousand people and two policemen. It was a night that will go on record, like it has in the Adelaide Law Courts.

This was followed by a slightly more sedate show; the Engineering Ball. Greg Kemp did a great job in organising and making it a tremendous success.

The growing bond between A.U.E.S. and The Institution of Engineers was extended when, at the Engineering Dinner, we were honoured by the attendance of Mr. C. J. Littleworth, the secretary of the institution.

A first-time success was the Engineering inter-department football matches. This brought together a great cross-section of the faculty, both players and spectators. Engineering students in general do not have much time available to see other students not in their year or department, and it was good to see internal fraternisation.

I would like to personally thank Andrew Neal for the magnificent job he has done in organising and showing the lunch-time films. He tracked down a diverse range of films, both semi-technical and for general interest.

Another two people I would like to thank are Mrs. Walls and Pauline Prisk, the Civil Engineering department secretaries. They do most of our typing and look after ticket sales for many shows. Their help is greatly appreciated. Pauline, amongst many other things, typed and ran off the four letters which were sent to members. This year we tried to keep the members as best informed as possible by letters and by Doug Elix's posters.

We have been very pleased with the increase in Staff interest in the Society. The dean, Professor Woodward, took a special interest in the committee, and his attendance, along with that of other members of the staff, at many of the functions, was greatly appreciated.

I know the committee would like me to thank Ray Miles, whose knowledge of facts and figures helped boost the Society's finances and kept us out of a few tricky situations.

Now I would personally like to thank the committee of the Engineering Society for whose help and support I am very grateful. Without their co-operation and enthusiasm the year would not have been the success it was.

THE PRESERVATION OF MAN

The horse and mule live 30 years,
And nothing know of wine and beers.
The goat and sheep at 20 die,
With never a taste of gin or rye.
The cow drinks water by the ton,
And at 18 is mostly done.
The dog at 16 cashes in,
Without the aid of rum or gin.
The cat in milk and water soaks
And then in 12 short years it croaks.
The most, sober, bone dry hen
Lays eggs for nods, then dies at ten.
All animals are strictly dry,
They sinless live and swiftly die.
But sinful, ginful, rum-soaked men
Survive for three score years and ten
And some of us, the mighty few,
Stay pickled till we're 92.

A.E.U.S. CAR TRIAL, 1967

After an intensive publicity campaign, during which three campaigners were booked for placing posters on cars without a permit (!), a grand total of fifty cars turned up at the start. This was most rewarding, and proved that a "driver's" trial is the most popular type. Some four hours and ninety miles later, forty of these cars were parked on the Clarendon Oval while their inhabitants partook of chops, beer, etc. Of the missing ten, two were unfortunately involved in prangs, three or four suffered mechanical problems, and the others just didn't turn up! All I can tell you about the results is that a Hillman Imp won, and a Triumph 2000 was second or third (bloody good cars). One of our two organisational blunders was omitting to take names and make of car of each entrant, hence the lack of detail—the other blunder was a bit of a bottleneck at the Woodside control. Generally though, everyone did a very good job, and I heard only one complaint, and that was about the Woodside hold-up. The highlight of the show for yours truly was the demise of the Zephyr on the way to the finish —the load of 1 concrete washtub, 12 dozen Cottees, 38 gallons of beer, sundry assorted gear, not to mention a wife, was the final straw. Other highlights included the sideways arrival at a secret control by persons un-named, Hall taking fastest time on two tests without the benefit of foot brakes, and a Holden driver stopping for a mythical train on the hillclimb. In all a good show, and we hope for an even better one in 1968.

Rita was doing very poorly in history and one day was called into the professor's office for a conference.

"I'll do anything if I would pass, professor, anything at all."

"Anything?"

"Yes, anything."

"Are you sure?"

"I have to pass, professor. Yes, I'd do anything."

"Hmmmmm, what are you doing Friday night, Rita?"

"Why, nothing at all, professor."

"Well, Rita, I think you might do a little studying."

ADELAIDE UNIVERSITY ENGINEERING SOCIETY

ASSETS AND LIABILITIES

as at 11/9/67

Assets	$	Liabilities	$
Bank Balances—		**S.R.C. Loan—**	
General Account	410.16	For purchase of Ties	567.00
Special Purposes A/c	185.41	Excess of Assets over Liabilities	624.54
Society Ties (at cost)—			
185 at $27 per dozen	416.25		
Society Badges (at cost)—			
204 at $10.50 per dozen	178.50		
Petty Cash	1.22		
	$1,191.54		$1,191.54

Audited and found correct.
September 16, 1967.

(Signed) JAMES H. FOWLER, Senior Lecturer, Mechanical Engineering.
(Signed) RAY MILES, Hon. Treasurer.

ADELAIDE UNIVERSITY ENGINEERING SOCIETY

STATEMENT OF ACCOUNTS, 1966-1967

to 11/9/67

Receipts		$
Bank Balance (28/8/66)	$249.06	
Less Cheque	2.40	
		246.66
Bank Interest		17.22
Membership		233.50
Badge Sales		45.00
Tie Sales		180.50
Ball		634.90
Dinner		207.00
Car Trial		40.28
Barbeque		966.95
Football Carnival		32.00
Other Social Events		19.00
Coca-Cola Machine		786.70
Hysteresis (Sales and Adverts.)		337.90
S.R.C. Grants—		
Hysteresis (Magazine)		80.00
Ordinary		80.00
Special		80.00
Travel Subsidy		105.20
S.R.C. Loan—		
For purchase of Ties		567.00
Symposium Fares		189.00
Miscellaneous		8.12
		$4,856.93

Expenditure	$
Badge Purchases	210.00
Tie Purchases	567.00
Ball	718.82
Dinner (incl. $10.07—1966)	272.06
Car Trial	49.65
Barbeque	745.68
Football Carnival	46.00
Other Social Events	22.88
Coca-Cola Machine	547.80
Hysteresis	487.00
Petty Cash	34.00
Repay S.R.C. Loan (1966) Badges	200.00
To Special Purpose Account	150.00
Postage	36.90
Travel Subsidy	105.20
Barbeque Fines	23.00
Symposium Fares	189.00
Miscellaneous	41.78
	$4,446.77
Bank Balance (11/9/67)	410.16
	$4,856.93

Audited and found correct.
September 16, 1967.

(Signed) JAMES H. FOWLER, Senior Lecturer, Mechanical Engineering.
(Signed) RAY MILES, Hon. Treasurer.

THE BEST OF BOTH WORLDS

by Terry O'Shaughnessy

"Vitruvius has all the marks of one unused to composition, to whom writing is a painful task . . . in his hand the measuring rod was a far mightier implement than the pen."—Professor Morgan.

It is obvious that Prof. Morgan (Vitruvius's faithful translator) thought the old engineer's Latin was bad. In fact, the professor is so faithful, or the Latin is so bad, that the translation contains crudities of expression that the professor purposefully imitated, not only to reproduce . . . but give a clear picture of the working of his (Vitruvius's) mind. Good oh; we must all earn our bread, and those who know no algebra translate bad Latin; but you can see all through the thing (and the "thing" is the Ten Books on Architecture, written when Nero was a lad) a slight suggestion of distaste, for someone who "uses only the simpler subjunctive constructions".

The punch comes now, early when you least expect it. Do you, in your ignorance, "use only the simpler subjunctive constructions", or whatever the modern equivalent is? If you cannot work that sentence out (and I am a bit weak on the subjunctive myself) just think back to that word *distaste;* do you suspect that you could be accused (behind your back if your friends are polite) of being lacking in the finer points of "belles lettres"? When the question of your Arts friends changes from, "What do you read?" to "Can you read?" you know you have created the wrong impression. This is the rub, and it has been rubbed a lot, but I am going to have my say, for all the obvious reasons, and a couple that are not so obvious.

But first I must say something about C. P. Snow and F. R. Leavis. I hope you have heard of the first and not the second, for they are novelist and critic respectively; but if you have heard of neither, at least you are unbiased; and if you have heard of both, you should not be reading this article. These two had a fight that stemmed from a lecture of Snow's given in 1959 (and subsequently published) called "The Two Cultures, and the Scientific Revolution", and from a lecture by Leavis, also published, given three years later that vigorously attacked both Snow's lecture and the man himself. So what! I can hear, but for those who have not worked it out for themselves from the title of the lecture, the point is that Snow was a scientist as well as a novelist; and a fairly down-to-earth type of scientist at that (his enemies accused him of being bureaucratic). And (need I say it?) Leavis was not a scientist; he was in fact, like our friend Morgan above, a university professor (I knew someone would say "but so was Snow!" . . . yes, Snow was an academic, but when the other academics accuse him of being bureaucratic, I think the thing goes by default and ends up, like the root of X^2, somewhere like normal.)

Snow's idea is not a new one, but the scientific revolution he talks about gives it new emphasis. The two cultures are, of course, the literary or traditional culture, and the scientific; and the lecture is about the *growing apart* of these two cultures. He talks about education, for it is in education that he sees this happening dramatically, and he talks about the difficulty of scientists coming to terms with the traditional culture. His sin though (in the eyes of his many critics and Leavis in particular) is that he implies that the traditional culture can be avoided by people who are otherwise, by all indications, reasonable and intelligent. This is where the traditionalists cannot follow. For them, what Snow calls the second culture is not a culture at all; moreover, Snow (they say) by this description is not only stating something that is false, but doing harm to the culture they have come to accept fully. This hurts, because, in their view, this traditionalist culture is the essence of living, and is *necessary* to give meaning to all these other, undoubtedly useful things, like science. To think that science can get on without this culture is foolish, to say that science can become a culture in itself is criminal.

C. P. Snow is, of course, in the ideal position to make such an observation; he himself says that he was fortunate to combine, by training and inclination, these two cultures. It should be pointed out too, that Snow does not think of something terribly esoteric and refined, for him science very definitely is what we call technology. No, it is not contemplation of the "Uncertainty Principle" or the "Parity of Time" that he is thinking about, but mundane things like abolishing poverty and feeding the world's population. *Little* things like that. No wonder the humanitarians found it hard to swallow.

But here the question comes up of exactly why did Leavis attack Snow at all, and when he did, why did he launch such a vindictive and personal attack against Snow's reputation as a novelist? If Snow is a bad social philosopher (and if social philosophy is what he was trying to write in his rather unambitious lecture) why not just attack the ideas; if he is a bad novelist it does not really have much bearing; and if he is both (and a poor scientist to boot), why listen to the man at all? No, Leavis felt attacked in the "Two Cultures" lecture, and fought back tooth and nail.

Do not think, however, that by searching the text of "Two Cultures" you will find a veiled reference to Leavis himself. No, the attack I am talking about was what I mentioned earlier, an attack against an idea of a culture, a culture Leavis felt committed to. Ha! you will laugh, a squabble about definition of an airy-fairy word like culture; how silly can they get! But look at it like this. . . .

You are in the Ref (for a well-deserved rest, no doubt . . .) Politics III student (read and studied fifteen or twenty authors on the subject of the Russian revolution, had a special interest in the topic for three years, just finished an essay on Leninist thought, hopes to write thesis and study at ANU in this field) is talking to: Engineering I student (got a B for Leaving history, but dropped the subject to concentrate on Maths.).

Pol. III: I think Lenin was justified in assimilating Marxist dogma to the thing . . . after all, the revolution *did* happen. . . .

Eng. I: Well, after all, you know all about this, but I still think. . . .

And so on. The discussion can and will proceed until, as usually happens, one of the two gives up with despair at the other. Perhaps discussions like this are rare, and surely they usually end precisely "n" random steps from where they started; in a word, nowhere. But the point is that both the "humanitarian student" and the science or applied science student feel they have a certain common ground when it comes to things like politics and religion and even history. But now reverse the roles, with a final year engineer and an English I student discussing the Second Law of Thermodynamics; or even let this topic come up with the same ill-matched pair, and what happens?

You know as well as I do, as well as any science student knows who has come from an (infrequently, worst luck) inspiring lecture, to be shot down, or rather drowned in blank looks, when he tries to communicate some of his enthusiasm—blank looks that say "I don't understand, and what's more I don't have to understand, and if I don't understand your idea is meaningless to me!" Suitably deflated, you retire. Perhaps next time something "intellectual" comes up you make a gesture, or just fail to say anything at all. But whatever you do, you cannot pretend to be intellectually superior at the same time. You are doomed. Sadly you contemplate your approaches:

(1) You could deny that you are an engineer, make a new circle of friends and grow your hair long (not mod long, but long intellectual) and be seen reading difficult books in French.

(2) You could give up, avoid people that talk, and become in effect the very thing these people thought you were in the first place—the 9-to-5, no-other-interests science student.

(3) You could tell your girl friend, or, failing that, your mother; both of whom will have infinite trust in you, and will be suitably sympathetic. This, I think, is as much as you can hope for:

Or, and this is what usually happens, you give up and go your merry way, putting this sort of impasse down to incompatability and letting it go at that. It does not matter after all. Very well, the thing slides along, and if you think about it at all, it is only with a faint feeling of regret and a sense of missing out on something.

Before getting back to explanations, I think I should say where I stand. I like discussing things, talking with people who are doing different courses and have got something to say, and I certainly do not think I have a right to bore these people with specialist knowledge. But herein lies the crux.

The Arts students this sort of thing happens with feel a *lack* of such a specialised pigeon hole to cultivate exclusively, for any humanitarian study will, by definition, concern the specialists (who after all, are human, too!); and these specialists will leap in with unwanted and probably useless opinions based on absolutely no evidence. The converse just does not occur; Arts students cannot study stress analysis in their spare time (even if, and the question raises an infinite number of possible insights into the human mind, they should want to). It is just not fair, we get it both ways. Or rather we try to get it both ways; a better solution is that we do not understand either culture, but especially the private domain of the humanitarian. Thus Leavis attacks, and in doing so, tries to make his world of the "intellectual" a tighter, closed group, and driving the scientists away into a world of their own. Leavis attacks and the scientists retreat; the first battle occurred in print five years ago, but the same encounter occurs every day, in the Ref, at parties, at all sorts of unlikely places . . . and it is not about "definition of culture", or any other string of words that could be accused of being meaningless; it is about things that matter whether you are a scientist or an engineer or a humanitarian or what, and if you happen to be a student as well, they matter very much.

CONCRETE WITH KERR

Concrete is the world's most abundant building material. Last year the total world production of concrete was about 3 billion tons. With a world population of 3 billion people that means an average of about 1 ton per person.

Furthermore, annual production of portland cement has doubled in the last 20 years. Since the world population is doubling only every 40 years, anybody with a grain of feeling for advanced arithmetic will see that by the year 2400 the world will not be covered by people, but by concrete.

Cement

This basic recipe for portland cement is as follows: Take one cup limestone, crushed; add one-half cup of clay or pulverised shale (plus perhaps some sandstone or iron ore, depending); mix thoroughly and grind up fine; bake in a white-hot oven, 1,400 or 1,500 deg. C.; cool, add one tablespoon gypsum, and grind very fine. If you can do this for a dollar a bag (94 lb.) you can almost compete.

Concrete

Portland cement concrete appears rather simple but has a complicated inner chemistry, being more than a bit like women in this respect. Easy to get along with (and they claim impossible to get along without), and apparently minor mismanagement can bring disaster. In fact, concrete is rather abstract, in spite of dictionary definitions.

To Make Concrete

Take one cup portland cement, 2 of sand and 3½ gravel, blend thoroughly, and marinate in just enough water to make a thick batter. The thicker the batter the stronger the concrete.

The concrete is now ready to pour. Be sure to grease your pan first, and after pouring you'll want to slap it around a bit or vibrate to get the excess air out. If it comes out of the pan in one piece you have been lucky.

Cover with wet towels for one week, and we guarantee you will look like a new slab.

Now you know the business, please do not say "cement" sidewalk, or "cement" structure. There is no such thing as a "cement" sidewalk. The sidewalk is concrete. Or wood, or bricks or grass or gravel or muck or tank traps.

(Reprinted from: Screenings from the Soil Research Lab., Vol. 8, Iowa State University of Science and Technology.)

MATERIALS SCIENCE

While you are undergraduates in the Engineering Faculty here at Adelaide University, I hope that each one of you will seize every available opportunity to seek out Engineering Graduates of bygone years and question them at some length about the exact nature of the job which they are doing. I am sure that you will find this a valuable exercise for it will give you an idea of the sort of position which you yourselves are likely to hold in future years. I hope, too, that you will try to ascertain from these graduates the relevance to engineering practice of the various subjects which you are at present studying for although there is surely room for improvement, I think that you will come to the conclusion that the range of topics covered in your course has been very carefully chosen to be of maximum value to you in your future engineering career. However, if you ask these graduates to tell you which aspect of their practices they find themselves least prepared by their University training to cope with, I think it likely that the answer will be, "We don't know enough about the properties and behaviour of the materials which we are using".

It was a recognition of this blind spot in the training of our engineering graduates which led this University to establish courses in Materials Science and Engineering Materials and in the last few years an increasing emphasis has been placed on the importance of these subjects, in each of the four Engineering disciplines. (Engineering Materials is the subject taken by Civil, Electrical and Mechanical engineers and is a slightly shortened version of the subject Materials Science taken by Chemical Engineers in the third year of their course.) The aim of the subjects is to provide you with information which will not only enable you to understand the properties of the materials used at present in engineering practice but to enable you to keep abreast of the extremely rapid developments which are occurring in this field.

Quite clearly, in a one-year course we are unable to deal, in a comprehensive manner, with all, or even the majority of the materials of engineering significance. What we aim to do, therefore, is to present the principles of Materials Science—firstly, that in order to use materials safely and efficiently it is necessary to not only know what their properties are but to understand why they have these properties and secondly, that the properties which materials display are inextricably related to their structure. The understanding of this relationship between structure and properties of materials is really the basic plank in the Materials Science platform. This may, at first sight, seem to be a rather academic subject. In fact, this is not so. Materials Science is essentially a practical subject but it is one which is treated from a fundamental viewpoint. These fundamental issues are illustrated by drawing freely on examples taken from the best (and also the worst!) of present-day engineering practice and those of us who are involved in the teaching of Materials Science and Engineering Materials would like to think that we have begun to succeed in filling in the important gap in the previous training of our engineers.

Very closely related to the lectures is a course of practical work. This is a completely new series of experiments which are specifically devised to illustrate points made in the lectures. The equipment is modern and brand new and the experiments range over a wide variety of subjects from a demonstration of the mechanical properties of polymers, to heat treatment of steels and to the application of X-ray diffraction techniques to the study of solids.

In addition to teaching these undergraduate courses a small but vigorous research group has been formed. This group is using electron microscopy to study the way in which zirconium, a metal of importance in nuclear reactors, behaves under stress at high temperatures. Already, very significant progress has been made on this project and as the research facilities continue to build up some very exciting work should develop.

Now what of the future plans? As I have already mentioned, a course of one or two lectures per week for one year is a hopelessly inadequate training for a man wishing to become a Materials specialist and although all engineers need a basic training in Materials Science, industry is now crying out for Engineers with a far more extensive knowledge of this subject. To meet this additional demand, we are proposing, in the next triennium, to introduce more comprehensive and advanced courses in Materials science which will be offered as options, in the first instance, in the Chemical Engineering course. But more about this some other time!

Professor D. R. Miller.

Perplexed wife at dinner table, to angry husband:

"Monday you liked beans; Tuesday you liked beans; Wednesday you liked beans; now, all of a sudden, on Thursday, you don't like beans."

PAECH'S SUNBEAM

OR HOW TO OCCUPY YOUR SPARE TIME WHILE STUDYING

by Ivor Paech (Final Year Mech.)

Although you may not have seen it, the car in the photograph was used to advertise the Engineering Car Trial.

While on display, it aroused some curiosity and for this reason I have been asked to write something about it. Preferably the truth.

Well, I'm not too sure of its history myself, but it came out of the Sunbeam factory circa 1927 and somehow got to Australia, where it eventually fell into the hands of a young gentleman who was prone to getting through a car a week (so the story goes). Anyway, true to form, he collided with a tree, whereupon the throttles jammed open. The motor was then an original twin overhead camshaft and quickly responded and while the young man hid behind a tree, it tore itself to pieces.

Its life after this is obscure until it reappeared in Sydney some time after the war. Although it had been beautifully restored, it had a Mercury V.8 in it and had been slightly shortened in the chassis to improve handling. A friend of mine bought it in this condition and had a gay old time, having considerable success at hill climbing and enticing young ladies. Alas, he eventually married (he blames the car) and as is so often the case, gave way and sold the car. It then fell, in turn, into the hands of every hot-rodder in Broken Hill and left quite a trail of destruction (the number of accidents in which it was involved would fill a small book). Then one day the same friend of mine discovered it in a flooded paddock at Broken Hill much the worse for wear, and, feeling nostalgic, bought it and put a 1926 Sunbeam touring motor in the chassis. After a careful search had revealed most of the parts, he drove the car to Adelaide in an epic of endurance. A few years later he decided to restore it and hired me to help him, but business commitments forced him away from it and then I was able to talk him into parting with it.

It was then only partly restored (the chassis was driven home without a body) and 18 months more work was spent on it.

About the performance—on a long trip 18 m.p.g. was realized from the OHV Sunbeam engine (3.6 litres). It has four forward gears (clash type with gates) and an approx. top speed of Mach 0.11 (sea level), but I have not yet found a long enough road to reach terminal velocity.

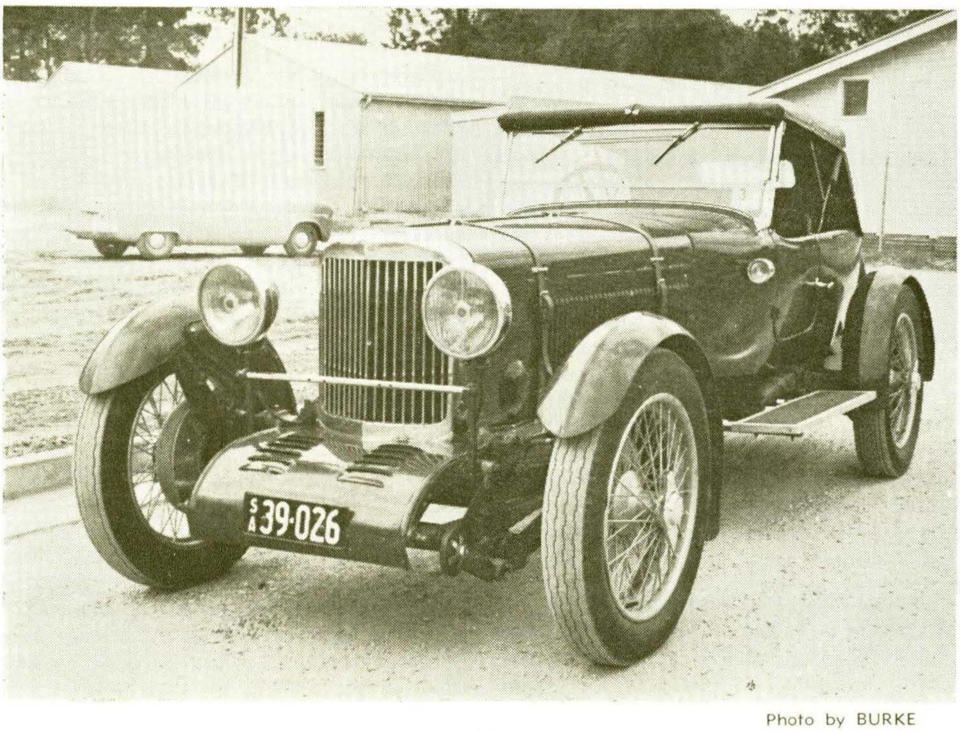


Photo by BURKE

ENGINEERING IN THE U.K.

by James Peterson

Engineering in the United Kingdom today embraces many technologies. Although with the technological advancement and industrialisation of emerging nations, its share of world markets has undoubtedly fallen; nevertheless many important discoveries and applications have been made.

The population of the country is in excess of 52 millions, the greater proportion of the working population being employed in the manufacturing industries. Also the greatest concentration of people is found in the London and south-eastern region of England. This fact, together with tendency of industry to concentrate here, has prompted the present government to offer incentives for the establishment of industry in parts of the country less well endowed and to halt the migration trend. For instance, the government has found it necessary to deny planning permission for office building in London itself.

Technical education is provided by Institutes of Technology, Universities, and Advanced Institues of Technology. The latter have been recommended by the Fieldon Report on education to become degree granting institutions in their own right. There are over 20 Universities, of which six are in Scotland. At the expiration of three years, the student obtains a pass or honours degree (two classes) except in Scotland, where a four-year study course is required for an honours degree. It is also a feature of the Scottish system that the candidate must prepare a thesis on an approved subject during his final year of honours study.

The professional classes are served by various Institutions. The engineering institutions are separate bodies, e.g., mechanical, civil, electrical. Recently there have been moves to unify the various councils, but still allowing the groups to function more or less independently. This union would permit the engineering profession to speak more effectively on matters of common interest. Admission to the professional institutions is through a University degree coupled with suitable practical experience or by passing the examinations set by the bodies concerned. This latter method is under review, with the object of establishing common examinations, equivalent to degree standard, with specialisation in appropriate subjects as the course progresses.

Industry itself tends to concentrate in certain well-defined areas. There is a considerable variety of general engineering activity in the south-east and midland regions ranging from mechanical and electrical to nuclear power plants. The shipbuilding industry is found mainly on the northern coasts of England and in Glasgow, Scotland. This latter industry has undergone a considerable amount of rationalization, the number of companies have been reduced by amalgamation or liquidation, in an endeavour to meet competition from emerging countries (e.g., Japan).

So also has the aircraft industry been rationalized, there being but two major manufacturing concerns and one major engine builder. The number of aircraft types have been reduced, several experimental versions being cancelled in recent years in an endeavour to reduce costs in view of the economic position. The British Aircraft Corportion is the main contractor for aircraft structures, whilst Rolls-Royce have the major share of the engine market.

Again, there is the joint Anglo-French enterprise concerned with the development and manufacture of a supersonic transport. The airframe is being manufactured by the B.A.C. (Britain) and a French aircraft company. The engines are of British manufacture. The present British Labour Government wished to cancel the project on economic grounds. France's De Gaulle had other views and threatened to take the matter before the International Court if Britain withdrew. This had the desired effect of continuing British support for the project.

Hovercraft, or ground-effective vehicles, have also received much attention and are now in an advanced stage of development. Such vehicles are supported on a cushion of air, generated by fans at relatively low pressure. Air control is effected by a flexible skirt attached around the vehicle. Propulsion is by means of conventional aeroplane propellers. The craft is capable of operating over land or water and does not require special berthing faciliites. It offers a relatively stable passage over comparatively choppy water.

Diesel-electric, diesel-hydraulic, and electric locomotives have for all practical purposes replaced steam as the source of traction for the railways. Considerable improvements in the design of rolling stock have been made. The railway system is divided into regions for administrative purposes and there is a comman standard gauge. The Southern Region, to the south of London, is almost completely electrified and is the one region to operate at a profit. It is the intention to extend the electrification to main lines in other regions. Local electric systems operate in other large cities for commuter traffic.

In yet other areas commuter traffic is catered for by diesel-hydraulic railcars and carriages. In peak conditions of traffic, these units may be connected together to form a reasonably long train. In this case there is more than one driving car interposed along the train length. Control is exercised from the leading car through appropriate hydraulic and electrical connections. During winter conditions passenger comfort is provided by a circulating warm airstream, which effectively reaches all parts of the carriage.

The electricity industry is controlled by a central policy body, the Central Electricity Generating Board (C.E.G.B.), which is a State body. It is subdivided into regions for administrative purposes. Power is generated in coal and oil-fired stations, in nuclear power stations and, in Scotland in particular there is an abundance of hydro-electric power. The power thus generated is fed into a system of high voltage lines carried on pylons throughout the country called the National Grid.

Oil and coal-fired stations predominate. Oil is proving a serious competitor to coal, notably on account of ease of handling, and the cost factor compares favourably. At one time it was thought that nuclear power would be a very strong competitor, but this has not materialised. The cost of power generation is somewhat greater than from other sources. The capital cost of such programmes together with the stringent conditions of safety and cleanliness which must be observed have contributed to this. However, there are some four or five stations in operation or being built.

With the discovery of large deposits of natural gas in the North Sea basin, stretching roughly from the north-east coast of England to the Dutch coast, it would appear that the gas industry would now claim an increasing share of the industrial power market, especially with regard to heating applications. It has been the practice in recent years to enrich the town gas supplies by imported methane carried in liquified form in specially constructed ships.

Research is catered for by the universities, technical colleges, industry, and government institutions. The larger companies, such as English Electric, have large research and development organisations. Several government institutions contribute and much work is aimed at improving engineering practices. Examples are the National Engineering Laboratory (N.E.L.), Production Engineering Research Association (P.E.R.A.), Royal Aircraft Establishment (R.A.E.), National Gas Turbine Establishment (N.G.T.E.), to mention but a few.

Mention is made of some examples of work carried out in these establishments. For instance, at R.A.E., there is the development of a blind landing device for aircraft, as many of Britain's airports are regularly rendered inoperative in foggy conditions. This device is capable of relieving the pilot of all duties concerned with landing the aircraft, the device being controlled by radar beams from the ground. It maintains the aircraft in the correct landing attitude and adjusts the speed and controls as necessary. Practical experience indicates that this device is reliable and currently tests are being carried out by B.O.A.C. on some of its V.C. 10 jetliners.

Referring to the shipping industry, diesel power is extremely popular except for all but the highest power installations. A notable British engine designed for ship propulsion is manufactured by Doxford. It is one of the lightest and smallest on the market on a horsepower basis. Steam power is still favoured for passenger vessels on account of its vibration-free performance. There have been experimental trials of a gas turbine propulsion on board a tanker, but these did not prove an economical proposition. It is becoming established practice to design vessels with a high degree of automation, including data-logging units, and to centralise all controls and instruments in an air-conditioned control room.

Also under consideration is the direct control of the main engine from the bridge during manoeuvering and berthing. Engine operating parameters, e.g., temperature, pressure or cooling media and lubricating oil are controlled by suitable sensing devices incorporated in the appropriate circuits. These act directly, or are assisted by servo-mechanisms to operate the necessary control valves. In steam power, notable reductions in boiler size have been accomplished for a given evaporation rate.

The foregoing is a brief survey of activities in which mechanical engineering is prominent and no attempt has been made to cover other fields of engineering such as electronics, automatic control, etc.

CHIVALRY: A man's inclination to protect a woman from every other man but himself.

LADY: A woman who never smokes, drinks and only swears when it really slips out.

METALLURGIST: A man who can take one look at a blonde and tell whether she is virgin metal or common 'ore.

"PROXY PAPAS"

The year is 1967 and the British Government's policy of socialized medicine has been extended to include "Proxy Papas". That is any married woman not having a child after the first five years of married life, must receive the services of a Government man, who will attempt to be the means of her becoming a mother.

The Smiths have no children and the Government man is due. Smith leaves for work. He has a hangdog look as he pecks his wife, dutifully at his door.

Smith: I'm off. The Government man should be here early.

He leaves, and the wife pretties herself, putting on her most seductive negligee. But instead of the Government man, a door-to-door photographer, specialising in baby pictures, knocks on the door.

Mrs. Smith: Oh, good morning.

Man: You probably don't know me, but I represent . . .

Mrs. Smith: Oh yes, you needn't explain. My husband said to expect you.

Man: I make a specialty of babies—especially twins.

Mrs. Smith: That is what my husband said. Please sit down.

Man: Then your husband probably told you that . . .

Mrs. Smith: Oh yes! We both agree that it is the best thing to do.

Man: Well, in that case we may as well get started.

Mrs. Smith (blushing): Just where do we start?

Man: You just leave everything to me. I recommend two in the bathtub, one on the couch and a couple on the floor.

Mrs. Smith: Bathtub! Floor! No wonder Harry and I . . .

Man: Well, my dear lady, even the best of us can't guarantee a good one every time. But, say out of six, one is bound to be a honey. I usually have the best luck with the ones in the bathtub.

Mrs. Smith: Pardon me, but it seems a bit informal.

Man: No indeed! In my time a man can't do his best work in a hurry.

(He opens his album and shows the Baby pictures to her.)

Look at this baby, it's a good job, took four hours, but isn't she a beauty?

Mrs. Smith: Yes, a lovely child.

Man: But for a tough assignment, look at this baby. Believe it or not, it was done on top of a bus in Piccadilly Circus.

Mrs. Smith: Oh my God!

Man: It's not hard when a man knows his job. My work is a pleasure. I spent long years perfecting my technique. Now, take this baby. I did it with one shot in Alexanders' window.

Mrs. Smith: I can't believe it.

Man: And there is a picture of the prettiest twins in town. They turned out exceptionally well when you consider their mother was so indifferent. But I knocked off the job in Hyde Park on a snowy afternoon. It took from 2 in the afternoon to 5 in the evening. I never have worked under such difficult conditions. People were crowded around four or five deep, pushing to get a look.

Mrs. Smith: Four or five deep?

Man: Yes, and for more than three hours but I had two Bobbies helping me. I could have done another shot before dark but by that time the squirrels were nibbling at my equipment and I had to give up. Well madam, if you are ready I'll set my tripod up and get to work.

Mrs. Smith: Tripod?

Man: Yes, I always use a tripod to rest my equipment on. It is much to heavy for me to hold for any length of time. Mrs. Smith! Good Lord, Mrs. Smith, have you fainted?

Never miss an opportunity to make others happy—even if you have to let them alone to do it.

SPRING FEVER: When the iron in your blood turns to lead in your pencil.

SOB SISTER: A girl who sits on your lap and bawls, and makes it hard for you.

ACCOUNTANT: Draws back the sheets—has a quick look at the figure—makes an entry—and upsets the monthly balance.

CHOWILLA DAM

Introduction

The Chowilla Dam is to be built by the River Murray Commission near the borders of South Australia with Victoria and New South Wales. The purpose of the dam is to provide a storage for South Australia to ensure an adequate supply of water for towns and for irrigation and stock. A dam of some sort was proposed as long ago as 1912. This was probably a small off-river storage.

The size of the storage required now was set at about 3½ million acre feet. Three sites were tentatively investigated, one upstream and one downstream of the site finally chosen. The upstream one was found not to have the capacity required because of the proximity of the town of Wentworth. The downstream one was eliminated for technical reasons; it had a very narrow and incompetent abutment.

Site Investigations

In 1959/60 about 250 boreholes were drilled and extensive geological investigation was carried out. It was found that the river valley was composed of recent clays of thicknesses between 12 ft. and 30 ft. overlying about 100 ft. of permeable fluvial sands and many hundreds of feet of less permeable estuarine and marine sands. The abutment cliffs are composed of lacustrine sands overlain by a cap rock and clays.

From this investigation the decision was made to build the dam at this site. The storage capacity was found to be 5 million acre feet, for a maximum depth of 55 ft. in the river and 35 ft. across the flats.

Further site investigations were carried out commencing in 1964. These were done from the point of view of engineering rather than geology. For an earth bank lacustrine sand was found to be an excellent shoulder material, while a flexible core could be built from the alluvial clays. Some thousand boreholes and auger holes have been drilled in the last three years. Besides these, in locations where softer material was discovered, more detailed examination was made by probing with a Dutch cone. Sampling of the materials at various depths and subsequent laboratory testing were carried out and permeability tests were made in the boreholes. To investigate underseepage, pump tests were done and some

of these are still, in fact, being done. At the areas where it is proposed to build concrete structures, plate load tests were carried out to determine the elastic parameters of the foundation.

Design

The dam will be 3½ miles long and will cross not only the Murray but also Chowilla and Monoman Creeks, which are ana-branches of the Murray and of each other.

Most of the dam across the 3½ miles of river valley will consist of an earth bank. The shoulders will be made of lacustrine sand and the core of clays and silts from the river flats. The core will be extended in a blanket upstream to join with the natural clay blanket. In certain places where the foundation will be on deep clay it is proposed to install sand drains to accelerate settlement. Downstream of the core there will be a "tongue" or "chimney" drain of coarser sands which will lead seepage water to a downstream trench. A series of relief wells will be installed near the downstream toe. These will have two functions, firstly, to assure that the pressure in the downstream zone of the bank is kept low and, secondly, to intercept the seepage water from the sands underneath the dam. This seepage water is expected to be highly saline during the first few years of operation and it will be intercepted by the downstream drain and carried safely away from the river valley.

It is usual with earth banks to protect the faces against wave action by using riprap of large rock. Because of the large areal extent of the reservoir, waves 10 ft. high and more are expected during storms. After investigation of about 30 quarries in the vicinity, it was discovered that not sufficient rock of a large enough size was available locally for riprap. Consequently, rock has to be brought from over 100 miles away near Murray Bridge and a tramway is being built from Paringa to Chowilla to bring the rock to the dam. Because of the consequent high price of rock, it was decided to use a bituminous asphalt facing similar to that used in the North Sea dikes. A wave wall will also be required along the crest of the dam to turn back the peak waves and prevent overtopping.

On the eastern side of the river there will be a floodway, which will be a large concrete structure with a crest length of over 700 ft. This will be topped with 14 radial gates, each 40 ft. wide and 40 ft. high. Several model tests were made to determine the best shape for the crest and the best position for the radial gates. One model was built in England to investigate approach velocities on the upstream side of the floodway; from this the training walls were designed. In the eastern training wall there will be a fish pass to allow fish to travel upstream for breeding purposes. This was also investigated by means of models and measurements of velocities on existing successful fishways in the river structures. There will be a small outlet bay built into the spillway structure to allow normal river flow during dry periods without opening the radial gates. Downstream of the weir there will be dentates in a concrete sill to break up the flow. The design of these was determined from model tests. The structure will have fins of concrete on the side walls projecting into the clay core of the earth embankment to ensure an adequate seal. The structure will also have a bridge, as it is planned to have a road over the crest of the dam.

Because the natural clay blanket does not exist in the streams or the abutments and will be removed under the structures, a unique bituminous cut-off is to be installed in these places. This will be a trench 2 ft. wide and up to 100 ft. in depth, excavated by using a bentonite slurry and backfilled with hot asphalt-sand mastic. A test of such a cut-off has already been carried out at the site to determine the most effective methods of doing this.

Statistics

Dam—

Length, 18,000 feet.

Height above flood plain, 48 feet.

Type: Earth bank with clay core.

Quantities (in millions of cubic yards):

Shoulder material (lacustrine sand)	6.4
Core material	2.1
Slope protection	1.1
Filter material	1.1
Concrete (spillway and lock)	0.3

Spillway—

Length, 730 feet.

14 radial gates, each 40 feet wide and 40 feet high, of welded steel, weight 50 tons.

Concrete in structure, 250,000 cubic yards.

Storage—

5.07 million acre feet.

Water Spread—

530 square miles.

River Murray System—

River Murray proper: Length, 1,600 miles.

Main tributaries:

Darling	1,700 miles
Murrumbidgee	980 miles
Goulburn	280 miles

Drainage area, 414,000 square miles.

Average annual flow, 8,880,000 acre feet.

Largest recorded flood, 156,000 cubic feet per second.

Spillway design flood, 400,00 cubic feet per second.

Instrumentation

Instruments to measure pore pressures both in the foundation and the bank, and settlement during construction and after filling will be installed under and in the embankment. Instruments to measure joint movement and elastic strains will be installed in the concrete structures. Underneath the concrete structures it is proposed to put in gauges to measure total pressure to determine the pressure distribution under the structures as they are built and as the water load comes on them.

Items of Interest

We have found several aboriginal burial grounds and many canoe trees from which the aborigines have cut bark canoes in the area to be inundated. Anthropologists from both Victoria and South Australia are studying these before the dam covers them up.

During investigations we have brought timber up in states varying from sound to partly coalified from depths of 30 ft. and beyond. Radio-carbon dating carried out on one sample of sound timber proved it to be about 4,000 years old. We have also found bones at about 50 ft. deep or deeper; one of these was identified as coming from a Nototherium.

The name "Chowilla" is believed to mean place of the spirits or place of the sleepy lizard. These two interpretations do not necessarily conflict with each other if the totem beliefs of the aborigines are borne in mind.

Bunyip Reach is the name of the property on the eastern abutment and the name of a stretch of the river a little downstream from the dam. This was named after a steamboat, "The Bunyip", which burnt and sank there in 1863.

Upstream of the dam there are few buildings which will be inundated, but these include the Customs Houses between South Australia and the other two States, which are relics of the nineteenth century when the States were separate colonies.

When the dam is complete it will be hazardous for small boats to travel very far from the shores except in places like Lake Coombool and Lake Littra, which, though dry now, will remain areas of open water, even at the lowest storage level. The reason for this is that trees will not be cleared from the 500 square miles of reservoir area and, with high waves or even without, these trees will be a hazard for boating.

THE GOLF DAY

by P. E. Moorfield (Civil IV)

It is important for all budding golfers to adhere to the rules. In order to make life a little easier we have drawn up a special set of rules for the Engineer, some of which are reproduced below.

(1) Each golfer must be equipped with a bag or sack large enough to carry three Southwark or the equivalent. He must be armed with at least one club such as a broom, branch of tree, golf club, etc.

(2) Stagger quickly between bottles.

(3) Fill in all cavities you make or someone may fall into them.

(4) A ball landing in the sewer must be played from where it lies.

(5) A person who keeps persistently missing the ball must skull two glasses of Riesling (Hofftmans). This may succeed in lowering his head somewhat.

With these rules in mind a small party of Engineers held their Annual Golf Day at Harry Meyer's private nine-hole course near Strathalbyn on the last day of the May holidays. The following effort to describe the day is based on chippings of information received from those who were able to remember.

The day itself was bright and pleasant (Gloria Tibi Dominae) and showed all prospects of being a most enjoyable one. The course proper seemed to be well watered (even at this early stage) and was set amidst a natural country background in all its tranquility. The intention was to play nine holes before a barbecue lunch and another nine after.

To begin with, of course, eskies were set up at every second tee, while the body of the party put in a little practice on the putting green. Here it was found that one had to use a number one wood to make any impression on the 3-ft. high grass. However, an industrious student who was obviously a Boy Scout with "Be Prepared" (by Revlon) powdered all over his face, produced a hatchet and all our problems were solved.

Play eventually got under way at 11.30 a.m., and the first party comprising of Mr. Smith, Mr. Crawley, Andrew Lukasik, and Peter Moorfield were seen to step onto the second tee exactly 45 minutes later. A member of the second group later ran back to headquarters, claiming that there was a herd of elephants on the loose. He reported uprooted scrub, trampled undergrowth, and battle-scarred trees. I am told that by this time the rest of the party had slipped into blissful oblivion and chose to ignore the blabberings of the emotionally disturbed junior. He, too, later entered the deep sleep zone.

Play progressed rather slowly throughout the morning as some enthusiastic players insisted on trying every shot in the book (and out of it) from the most weird and wonderful positions. Mr. Smith occupied himself picking mushrooms, while Peter Ochota and Greg Kemp played an enjoyable game of marbles on the eighth green, and others found it far more worthwhile to stay at one esky than to have to walk two holes to the next one. Surprisingly enough everyone managed to hand in full cards at lunch time; goodness knows what they were scoring.

Lunch was a rather grandiose affair, consisting of snags on the rocks and chops à la Graham Kerr (on the coals). To give things a Continental touch, Mr. Crawley produced the now famous flagon of Riesling, which he passed around far too liberally and nearly missed out himself. (To all those grateful students who have been thinking of giving Mr. Crawley a Christmas present, may I suggest Hofftmans Riesling.) As the lunch break progressed, so too did the merriment of the gathering. "For He's a Jolly Good Fellow" was sung for Mr. Tyler (among other things), and we all drank to that. Several of the usual "stories" were told, and some photos of recent survey camps were passed around to be ridiculed by all but their subjects. All in all, it was a very "happy" bunch who made for the first tee again at 2.45 p.m.

It was decided this time, not without reason, to do away with the "standin' on the tyre" bit, at the first tee. Several other modifications were made to the rules, namely only when you hit the ball do you count it as a stroke, and even then only if it goes forward. If you think you can throw the ball more accurately, then do so.

In one way or another the party gradually hacked their way around the course. As the sun was dropping away on the horizon, several weary engineers trampled back to the clubhouse to mark the end of a most successful day. The score cards were handed in, and it was found that there had been a close finish between Graham Dick and Ray Miles with 223 and 219 respectively. A trophy was presented, but Ray found himself unable to make any remarks.

And so the Golf Day 1967 came to a sad and regretful ending. As we jumped into our cars and waved good-bye, Mr. Tyler was apparently digging an air raid shelter with a No. 8 iron on the 9th fairway.

PERISTALSIS--ENGINEERING STYLE

A highlight of Prosh week activities is always the Engineering Dinner. This year saw the venue as the Adelaide Country Club, a place well acquainted with our dinners, as could be seen by the few female waitresses, most of whom had been replaced by a number of thinly disguised bouncers.

No floor show was provided this year, as it was known from past experience that this would be provided later in the evening by Smith.

Proceedings began with free drinks on the society, and these were consumed in fine and rapid style. Such good rowing early in the evening was indicative of an upbringing in the hard school of the now infamous South Australian 6 o'clock swill.

The first sporting event of the evening was a hilarious game of musical chairs, as participants sprinted for the best seats. Winners in this novel game sit where they wish for dinner, whilst the laggards take their places at the head table and have a laugh with the staff. This game was not played strictly in accordance with the rules as a number of staff, making like students, managed to infiltrate the lower tables.

Greg Kemp, a musical chairs loser and obviously affected by the sparkling wit and wine at the head table, took longer than anyone else on record to give us "the Queen". Not that it was boring (witness: the assistant to the Dean still bubbling into his ginger ale an hour later about Kemp's riotous dictionary definition of "toast"), but most of the team had just finished quaffing their second round for the speech, as Kemp ended his sermon and the crown might have felt short-changed by some of the empty glasses that had to be raised. But Her Majesty need never fear on acceptance of Republican ideas within conservative eng. ranks, as could have been inferred from such glasses.

In proposing the staff, etc., Tony Bundrock and Professor Woodward provided much mutual verbal loving. After that speech Tony, you've got no worries come November. The prof. dropped a couple of hot ones which were greatly appreciated by the well-lubricated masses. Good to see that aspect of education.

The speaker was Mr. C. D. Littleworth, M.B.E. His subject was, "The Australian Institute of Engineers". Mr. Littleworth showed himself to be a competent speaker and a master of his subject matter, and he also made a very correct appeal for greater student participation in this professional body. The speech was informative and interesting. But the speech was not a success. It was neither properly absorbed nor thoroughly enjoyed by the majority of the students listening to it. The communication which Mr. Littleworth would have desired was not achieved, but the fault was not his. The fault lies in the dinner organisers who asked Mr. Littleworth to make an after-dinner speech on this interesting but not light-hearted subject to a group of, by then, fairly happy engineering undergraduates. The impracticalness of this proposal is obvious. This comment not only applies to this year, but to preceding years when the same absurd situation has arisen. I think we must revise our criteria for the selection of speakers, such that we work from one simple rule: the speaker shall be amusing (in speech that is) and the subject matter shall be anything that fits the speaker, engineering or otherwise.

The President, Bryan Jenkins, the only willing loser in musical chairs, made at least four speeches during the evening, none of which were heard. Still, I have it on authority that, as a President, he was very good at his paperwork.

Another highlight of the evening, apart from Smith, was the announcement by a close friend of Adrian Redden's engagement. This came as a surprise to all, including Adrian, who now insists that the animal never existed. Sounds as if the lad's made some sort of breach.

Brian Williams, reputed to possess the fastest one in the west, came along with a female in mind, but after eyeing off a black-beaded male waiter for fully two seconds, discarded the idea and his tie (sorry folks, that's all) and began singing Christmas carols in Latin. As he only knows one in Latin, this became somewhat repetitive.

But it was Hugh Luckhurst-Smith who provided the floor show. During the evening he lost his watch and removed three tablecloths looking for it. It was unfortunate that the tables had not been cleared prior to this removal of cloth. When the watch had been recovered, Hugh decided to test the plate glass window to determine a coefficient of restitution. When the window was rescued from Hugh, it had an amplitude of about an inch. Smith also had the distinction of being the only patron to get the manager, cum doorman, irate enough to draw himself up to his full height and tell Hugh's chest what he thought of him. Yes, congratulations Hugh, you performed brilliantly again; it was a great pity that the cold night air made you feel a little off colour such that you couldn't participate in the subsequent sporting fixtures.

As someone said when they arrived 20 minutes late for a Thursday morning lecture,

"Now that's what I call a good dinner!"

(Strebor)

THE DRINKING HORN

Every place of learning has its "extra-curricula activities" and the University of Adelaide is no exception. Possibly one of the most laudable of these is the beer skulling knockout held religiously every Prosh day. Unlike some other sports there are always plenty of keen contestants and some of them become so enthusiastic during practice sessions that they decide to take it up for life.

This year the Engineering team was picked at short notice and some practice was had at the Southwark Brewery (Official Sponsors), the Queens Head, and the Richmond. It should be pointed out here that practice does not always make perfect—one of our team members became so inebriated shortly before the big event that he failed to comply with the one condition of entry; all contestants must be able to walk.

Undaunted by this setback, the Engineers quickly found a replacement from a mysterious source and entered the Arena for the first heat. Only a quick glance at the opposing team was enough to lower the spirits of our boys. Splendidly dressed in matching T shirts with "Pharmasoaks" printed across their chests, they tested their glasses and moved into position with all the confidence of King Cassius preparing for the kill.

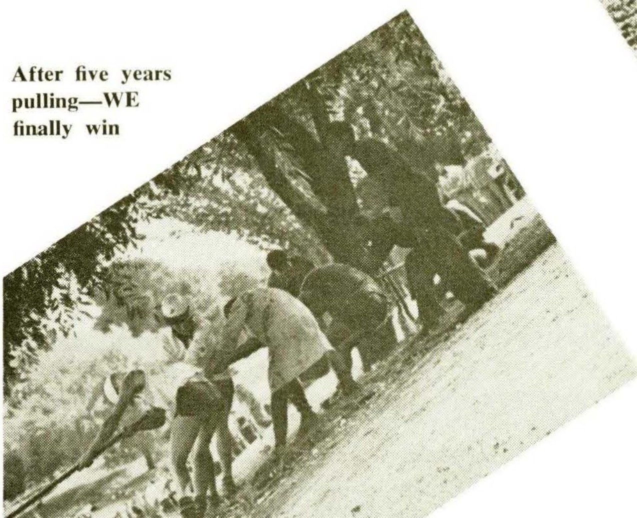
However, their sense of superiority was short-lived as the Engineers, being strong in conviction and unpredictable at times, tore it away from them with a good skull of 10 secs. flat. Triumphantly our team left the scene of the massacre only to return ten minutes later for the second heat. But glory is, at its best, only short lived—or so it was for the Engineers that day. For in that second cruel heat we faced the Legendary Law Team who calmly removed the crown from its head in a remarkable time of 7 seconds.

In any form of sport it pays to remember the motto "the most important thing is not to have won but to have competed". Whether this is applicable to beer skulling or not is debatable, but one thing is for sure and that is, "nothing ventured, nothing gained".

In any case there were six Engineers who had a ball trying to prove nothing in particular other than that they were as good as anybody else at the most odd callings. Those six were: Ian Clatturham, Doug Elix, Allan Blackburn, Peter Moorfield, Dick Wilson, and Graham Templer.

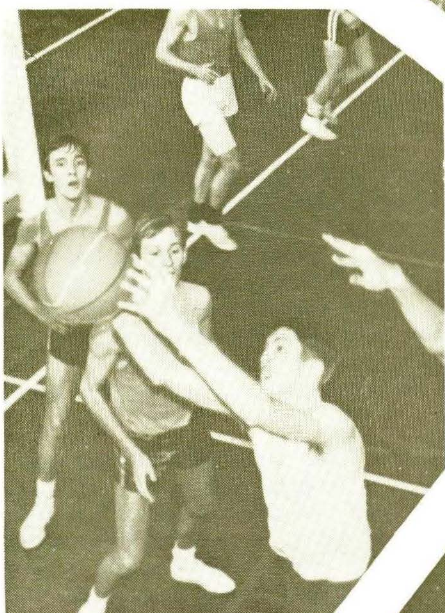
Next year's Editor

After five years pulling—WE finally win



"Oh! bother Dave— missed again"

Bottom's up (R-Sup)



Smiling Smith's Sterling Stretch

The FROTH. pours BONY Bumdrock a coke?

DISILLUSION?

(Bob Burke, Final Year Mech.)

Well, the long hard road has almost come to an end, and it's as good a time as any to draw conclusions and hand out free advice which is the kind nobody wants anyway. And in any case you wouldn't believe me if I said "give it away, it's not worth the time and effort", and nor would I when I started it all. So if you want a piece of paper that entitles you to earn half as much as a butcher or plumber or a quarter as much as a car salesman, then go right ahead. But if you really must have that paper then one headed B.Tech. would be less painful. By the time you have completed your regulation four or five (or seven if you're as dumb as me) years in the place you could have built a nice little world for yourself outside if you liked. Interest is everything, and a man can be happiest by following his interests and still be called a success. This, however, is in the realm of philosophy, so perhaps I should make some comments about engineering courses which I do know, in a way.

The most lasting impression is that a student seldom feels as if he was a part of the place, not until final year and sometimes not then. Project work in an assistant capacity right from first year might help, and so might common rooms or something similar that a bloke could call home. But mostly it's this atmosphere of condescension or disdain or whatever it is that too many lecturers cart around with them. Which is not helped by an almost universal lack of teaching ability and personality by these same people, or by the disinterest and inattention which soon develop in their classes. The ONLY intelligent way to run a lecture is to hand out the whole text in printed form and spend the hour explaining and enlarging it, in an interesting fashion—and illustrative examples are a MUST all along the line. Practical work too often achieves nought and could be deleted, but more positively could be turned into good research training by insisting that the student carries out all the design, layout and setting up of the experiment, as well as presenting a thorough report—BUT no more than one prac a week is feasible because of the time involved. Without a shadow of doubt the most important aspect to the student of all pracs, designs, and projects is the way it is MARKED. Nothing is more calculated to disillusion and frustrate a person than to have a report which has involved some twenty or thirty hours of anguished labour returned with a beta on it and nothing else. And equally bad is the inability of the markers to tell the difference between an authentic, time-consuming report and a rigged one.

On a more specific level, I think the subject matter of the course is in general well suited to engineering training. There were one or two subjects which were a bit off the beam, but there have been and will be many changes in these topics anyway. The teaching of maths could perhaps be handled more effectively by introducing the relevant methods of handling specific problems as the problems actually occur—generally it is necessary to revise the particular technique at that stage in any case. Dimensional analysis is a much neglected tool which would greatly assist problem-solving right from the start, and could beneficially be taken in first year.

Examinations are a necessary evil, but the very real strain and health hazard of third term, etc. could be significantly reduced by placing much greater emphasis on work done during the year. Oral exams, in capable hands, can help the examiner find out more about a student. The use of reference books and notes during exams on analytical subjects is the only realistic way to examine, and many more exams should be designed along these lines.

You'll disagree with a lot of this, and you'll probably call me a cynic or worse, and you might even be right, too. Whether in fact it has been all worth it can't really be resolved for another ten years or so, but what I can say with a great deal of certainty is that I'm a little more than somewhat glad to see the last of the place.

Did you hear about the two cannibals in a mental hospital?

One of them was cutting out pictures of people and eating them. Intrigued, his companion asked: "Is that dehydrated stuff any good?"

Fashion Review: Women will wear the same things in brassieres this year.

Did you hear about the razor-eating showgirl who cut two fingers off a casual acquaintance and circumcised her boy friend.

THE EXPORTER TODAY

With the advent of Supersonic Jets and Hydrofoil ships, along with some remarkable communications systems, it is becoming increasingly more feasible for the small manufacturers to take advantage of export opportunities. As the time and distance barriers are shattered, governing bodies all over the world are finding it necessary to constantly revise their Interntional Trade policies. Here in Australia present moves favour the potential exporter. He is offered radical income tax deductions, pay roll tax rebate, insurance at low premiums to cover all forms of trade risk and a limitless supply of market information.

The Australian Department of Trade and Industry has 43 trade commissioners in 33 diffent countries. Basically, its operation is to promote Australian goods abroad and provide market intelligence. Vital information such as Overseas Government moves which are likely to affect trade, current information relating to tariffs and import licensing, trade activities of other exporting countries, market requirements such as local tastes and prejudices, advertising media and shipping and transport handling are all supplied by the department.

Of course the best way to sell anything is to take it directly to the customer. International trade fairs provide Australian manufacturers with the means to do this. From 1949 to 1965 Australia participated in almost 100 major overseas Trade Fairs in more than 20 countries including Asia, Europe, the Pacific Islands and North and South America. This coming year there will be trade fairs in Manila, Naples, Los Angeles, Johannesburg, Lenia and Cologne, to name but a few. The pavilions are constructed by the Dept. of Trade, and although participants must pay freight expenses, the cost of staging the exhibits and organising associated publicity is met by the Department.

As regards taxation, the potential exporter is offered two incentives. Firstly, an income tax reduction for export promotion, which can mean a total saving of up to 80 cents in the dollar. This promotion expenditure includes fares for overseas travel, cost of participation in overseas trade fairs, cost of advertising, and salaries and expenses of sales representatives who are permanently stationed overseas. Secondly, he is offered a pay roll tax rebate for increased exports. The rebate is such that for an increase in exports equal to 8% of gross receipts, the producer earns complete rebate of pay roll tax on his entire business.

Insurance is another factor vital to the exporter. The Export Payments Corporation (EPIC), (a government body) offers a practical and worthwhile service to the Australian exporter. The following are some of the risks covered by the scheme; war between the countries concerned, insolvency of the buyer, revolution or civil wars in the buyer's country, and failure or refusal by a solvent overseas buyer to accept goods. The Corporation is authorized to insure up to a maximum of 85% against commercial risks, and 95% against political risks. In some exceptional cases where the risk is high but the export is in the interests of the nation, EPIC could be authorized to provide cover up to 100%. The premiums vary with risks involved, but on an average are 75 cents per $200. All premiums paid are allowable tax deductions.

There are many advantages, both to the individual and to the country, to be gained from export. These are due to the following; an increase in overall stability resulting from fluctuations in one market being dampened by another, and the increased profits resulting from a reduction of overhead costs per unit of output for increased output up to a certain optimum level. Both result in a better trade situation, for which the present Government should be commended.

In a rapidly expanding industrial society with such exuberant modes of transportation and communication, International trade is becoming more and more the hinge of our whole existence. Exporting is not only desirable, but it is a vital necessity. For these reasons and the above incentives provided by the Commonwealth Government, the exporter today has greater opportunities.

Footnote: There are many opportunities existing for Engineers in International Trade—in fact, the Regional Director of Trade and Industry in Melbourne, Mr. Barns, is a civil engineer.

"Do you know what they call a man who doesn't believe in birth control?"

"No, what?"

"Daddy."

Many a husband and wife are the life of the party, but it isn't always the same party.

FINAL YEAR CIVIL CLASS NOTES

Twenty-one students occupied the final year room this year, proving an extremely cumbersome number for card games. Some ill-informed people gained the impression that all final year civil's did was play cards. Actually it wasn't true, we attended lectures and played cards!

Except for building a car park, we didn't do much early in the year, but the Leigh Creek survey camp brought with it plenty of fun. Jeff Cantwell became champion wrestler at the Copley pub, whilst Steve Peake made friends with a character who rode a bike into people's rooms (with the door closed!) Rick Liney and John Sutton succumbed to the lure of the wet canteen and after several portergaffs each were seen hysterical on the corridor floor looking for their rooms. Peter Koukourou tried to con the girl in the mess but only got as far as her age. The married men showed obvious signs of frustration, as both Ian Pascoe and Andy Bruce found it necessary to come home during the camp. So did Dean Pritchard, but he still had a week to wait! Rick Liney made up for his isolation by getting overpoweringly perfumed love letters. "Hanging" from the railway bridge was a favourite event, the record number being sixteen. Dick Wilson also mastered the art of turning a back somersault off the back of a truck. Green ginger wine became a best seller for the cold train trip home.

Projects received a little more time in the second term, although many merely turned away and waited for the next deal. Everyone managed to write a seminar and deliver it to an eager audience (?) Certain of the staff had their sadistic tendencies confirmed as they shot down some of the speakers. The year should not pass without a brief glimpse at all the characters:

Jeff Cantwell—This man will be the only boundary rider in Queensland next year with an engineering degree.

Mike Rowe—Gained a reputation as a card player, and was often seen going "open" on three aces. Kept faith in Torrens to the bitter end.

Anne McCusker—Must be congratulated as being the first girl to make final year civil, and survive it!

John Sutton—This lad became famous overnight for his new design technique, the "Shot in the Dark" method. He declared that we all lived in a "cage", and enjoyed running down Liney. John provided a good performance at the Dinner as he thrust bouquets on his supervisor.

Rick Liney—After years of freedom is now under the thumb. Spends his time either running down Sutton or visiting a Dept. of Agriculture bird.

John Hayford—Signed his fate by getting engaged to Jenny. Always managed to write the longest designs and wreck expensive transducers.

Ian Pascoe—Was last seen squirting his monitor outside the hydraulics lab.

"Stevo" Peake—Had a way with some lecturers and was the authority on horses. Often seen taking bets from Ray No. 2 on Friday afternoons.

"Dino" Pritchard—Apart from getting married didn't do much this year except appear late often at 9 o'clock lectures.

Eugene Pocius—Achieved the distinction of being the only father in the class.

André Lukasik—Received the "best dressed" award (his umbrella always matched his handbag!) Retained a degree of sanity in spite of being a "Hysteresis" editor.

Peter Ochota—Noted for the wild parties at his flat. Was seen courting after the Barbeque but the affair came to a fine end!

Greg Kemp—"Of course, in Sydney we have the biggest and best of everything." Despite this handicap, Greg was almost completely accepted by the class, except at cards.

Malcolm (Mermaid) Langmaid—Was a dark suit man all the year and was often heard. Favourite saying, "I'll go open mazerre".

Andy Bruce—"Willy" seems to have survived the first year of married life. Invariably seen hanging from the window in anticipation of his chauffeur(ess).

Robert Smith—Last seen placing strain gauges on the new bridge across the Torrens. He makes the real plunge in December, much to Kathy's delight, and then heads for Darwin.

Peter Koukourou—Our star soccer player this year. Peter grew the best beard at Leigh Creek but it met with sharp opposition on his return!

Zisis Ginos—Eventually he forgot his principles and joined the card school. One of the brighter lights of the class (rated at 25 watts).

Ray Miles—Made a great personal sacrifice by removing his beard. Some people thought it was a blesing in disguise.

Peter Arbon—Created a record by being eight weeks late with his carpark design. Was crowned by AJR as "the Calculator".

Dick Wilson—The proud owner of a magnificent ginger beard, and the class expert on computers. Did a sterling job "chaperoning" Anne for the year.

"500"

FINAL YEAR ELECTRICAL NOTES

Due to a vacation practical course, the 1967 academic year began about three weeks before orientation week. Therefore, about 20 of us, still suffering from a summer hangover, assembled in the second week of February to begin three weeks of feverish non-stop work interspersed with coke at the machine, coffee at the refectory, lunch on lawns, beer at the Richmond, and the normal amount of idle chatter in the lab. Actually, the prac. course was not taken very seriously until a nasty rumour (which proved to be true) that all reports were due at start of lectures started circulating. This rumour caused a minor panic when it was realized that despite our best efforts, we had obtained stacks of results, all which had to be suitably processed to yield the nice straight lines, etc. that had been predicted. This processing is, of course, a universal problem and as everyone realizes, takes quite a large amount of time. Hence, orientation week for a few was spent working furiously in the library which, by everyone's way of thinking, was decidely the wrong direction in which to be orientated. However, despite this initial mis-orientation, everyone soon got back onto course and had a comparatively enjoyable year.

When the term proper began, and the class formed, there were anything up to 22 bright, clear-eyed students present, the actual number depending on what time Monday morning the count was made. Everybody soon settled down into a quiet, well-established routine, attending lectures or playing cards in the lecture rom, working on projects or talking about football in the laboratories, and drinking beer or porter-gaff at the Richmond. During first term most of the final years went on a wine-tasting picnic at Ron Falkenberg's winery. It was at this picnic that the harmless game "bottles" was introduced to several un-named class-members who showed an amazing ability to learn the game very slowly. It was more or less on the pleasant note of bottles that this particular day finished for a few, and our thanks to Ron for risking the winery and its good standing in the district by allowing us up there.

After the May vacation everyone soon slipped back into the first-term routine. During second term we were beaten by fourth years in football by 1 point. This was a big blow to our prestige, as not having played previously that year, we had been undefeated up to that point. For the

interdepartmental football match, the elec. team included quite a few "stars" from final year, but still managed to lose narrowly to Chems. These two events proved beyond doubt Murphy's Overload Criterion, viz.: "that a high potential of lecturing coupled with a low resistance due to project work lowers a student's football ability".

The final year class was rather a mixed bunch containing, among other things, an army officer, an Australian-ised Viet Cong, a winery owner, and a group of intellectuals with science degrees; the remainder of the class being made up of the normal run-of-the-mill engineering students. Lt. Graham was the Australian Army's military adviser to the class and when not divulging top secret information about the army, tried to recruit everybody by telling us about life in the Officers' Mess, where the cost of living is only 12 cents a schooner. At the other end of the scale was Nguyen, a genuine Viet Cong, whose mission was the general subversion of the class. He attempted this subversion by subtly writing various of Mao Tse Tung's sayings on blackboards around the place, generally ridiculing the Australian way of life, and in various other unseen ways. However, we effectively countered this with our own counter-subversion programme aimed at him. This had very good results, as his performance at the Engineering dinner showed. Also in residence in the final year room was one of the grand old men of the Faculty, Mr. R. P. Mere, whose vast and long experience of University life made him a ready reference for every song sung or poem recited or joke told, etc. at the University for the last "n" years. Space does not permit a more thorough discussion on the various characters in the class, however the class was so varied that it was almost a "you-name-it-odds-are-we've-got-one" type of class. While the strain of lectures, etc. was driving a few of us to drink, it was driving others to other things and, at the moment, we have in the class one married, five engaged, and several others considering either state. To these gentlemen we wish the very best, and with a view to the exams, we also wish everyone (particularly ourselves) the very best.

Money won't make you happy, but it's wonderful for quieting the nerves.

This job is so secret I don't know what I'm doing.

FINAL YEAR MECH. NOTES

The class of 1967—ah yes, it was a very good year!

Actually first term was quite restrained, some of us worked, in fact. There was of course the odd spot of excitement, mostly connected with the works visits—e.g. the departmental Falcon being passed simultaneously on either side by a red Vee-dub and a vintage Sunbeam, at about 75 m.p.h. But life really began with first term vac and Whyalla. A few isolated incidents will serve to illustrate—starting with the Seven Hills winery's excellent products, progressing through the spoon drain Hall hit at 80-odd, touching (lightly) on the shotgun and magpie, er, crow episode, and fireworks! Like firing rockets at passing taxis from the Hotel Spencer? Well, you get the idea. Seem to recall something about a skyrocket and the BHP offices, and umpteen bods with their yellow visitor's helmets on backwards, but most of it is mercifully lost in the haze.

Second term saw the establishment of the final year library, coffee club, and skipping association—Arnott holds the 30-second record at 92, whilst Paech managed five on one of his better days. Arnott also collected the ten cents for escorting an eligible female through the final year room. Computers came on strong, with everybody except Burke and Hall furiously writing programmes—said two types work on the philosophy that if you ignore computers and other strange beasts for long enough they'll eventually go away. With four married men in the class, the discussion on various topics tended to be quite interesting—there is nothing like a good education, and both Paech and Storer seem to be learning fast.

Third term, alas, brings exams, projects, and realities into our happy lives, so we won't talk about that. But what after that—future plans are many and varied: Drew and Heydrich are off to Boeing, Seattle and $8,000 p.a., Burke to WRE, Turangan to BHP Whyalla (of all places!), Paech's going to break his neck in a Spitfire, Storer's going to be taken by a shark, and Hall and Polson like Engineering so much they're coming back for more—just which one of these fates is the worst is open to discussion. To complete the picture, Yong and Arnott are going to buy an IBM 6400 and live happily ever after.

To sum up, here are some "statements of the year":

Polson—Quite seriously chaps, a Bristol is a very good motor car.

Paech—Time for a thickshake.

Hall—Only thing worse than rubber teats is a cardboard box.

Burke—Lies! It's all lies I tell you.

Storer—Oh I went down to the chandler's shop . . .

Drew—Who's fa-coffee?

Heydrich—You rangy single buggers wouldn't know.

Turangan—Confrontation forever.

Yong—Yongplot forever.

Arnott—Gunga Din anyway.

PABLO.

FINAL YEAR CHEMICAL ENGINEERING 1967

Chemical engineers—as the elite of the engineering body—are found on the top floor of the building. At first glance they are much like any other engineer, but closer inspection reveals
the eyes—just a little more sunken,
the step—just that much more deliberate,
their slide rules—just a fraction warmer.

A small—but select—group, the final year is a collection of all who have stuck it out for the past "n" years—whether through determination or rank stupidity is still under examination.

Those below are the final products (unrefined) of our staff's untiring efforts—Yes, we feel sorry for them too!

Greg "The Kid" Bailey—every other inch a gentleman.

Kevin Brenton—has gone the way of all flesh—sad.

Nugen "Yogi" Chominsky—". . . what do you know about Holden starter motors, radiators . . ."

Peter Fuller—Would be wasted in National Service—or industry—or research or—

Sal "S.P." Harahap—laughs and smiles every day . . . frankly we're worried about him.

"Kwoker" Kwok—inscrutable.

Jack Maley—when all about him are losing their heads . . .

Michael "Mac" McCarthy—words fail us.

Ron "R^2" Riegel-Huth—frustrated!!

Peter "Zorba" Tsiros—still thinks a football is round.

$$R^2 \left(= \frac{D^2}{4} \right)$$

FOURTH YEAR ELECTRICAL ENGINEERING

ELEC. II

PROF. WOODWARD is mainly noted for his red tie he wore throughout the year, he changes his suit but doesn't seem to change his tie. Maybe all his birthdays came at once one day and he got an abundant supply of the same tie.

He catches on quite well during lectures and senses that the students can't understand what he's talking about and goes about explaining the subject a second time and sometimes a third, but in the end it seems to come across. This is better than some lecturers who seem to have the confusing attitude of "Well! I've said it, you figure it out".

The fact that the MIKHAILOV Stability Criterion seems to be his best method for investigating the stability of a system has no connection with the red ties he wears.

P.S. For more information of the Criterion above consult Ch. 7 of "The Dynamics of Automatic Control Systems" by E. P. POPOV.

D.C.P.—the student's friend, Mr. Pawsey. One of the most pleasant lecturers I've encountered during my course. He seems a very quiet person —and he is—but if you listen to what he has to say, you give him credit for more knowledge than you thought he had. His biggest rib-tickler during the year was one day he had slammed one of the blackboards up and made one hell of a bang. He turned around and said, "This is the only way I've got of releasing my inner frustrations".

DR. GRIFFIN—the engineer that is stationed over in the Physics Department most of the time because they've got better equipment than the Engineering Department. It's OK when he's talking about filters and transmission lines—they only become increasingly difficult to understand—it's when he gets to wave guides that he leaves the class dumbfounded, especially when you get eight pages of typewritten notes explaining how to work out a problem (only involves 82 equations).

The one thing that DOC. assures us of during his lectures is that he's an expert on his subject. We would be in a crook old mess if we got someone that wasn't as thorough on the subject.

DR. B. SMITH, very refreshed from his overseas trip, came bounding into the year with two sets of notes to lecture from. That's OK if you get one set separated from the other, but when you get one set mixed with the other set and use different subscripts etc., in each set, that's chaos. He assumes too much previous knowledge on the subject and leaves too many gaps in the students' minds.

However, we have had some humorous incidents with this gent. One day, J. TWINING was late for the lecture and arrived with a large parcel under his arm. Smith's remark was, "You didn't have to bring me a present just because you were late." It took him a while to think it up, but it did raise a laugh from the class. Also, during a tut., one day, he was getting a bit upset about the noise and said, "Break it up." Thereupon P. BALAN leant on his desk and it fell apart—coincidence? or was he doing what he was told?

PHYSICS II

Three cheers (or is it jeers) for PHYSICS II, the subject that is very good to make you run around in circles biting your tail.

DR. MACKENZIE—the great Nuclear Physics and Electronics man who has forgotten what punctuation is—probably thinks it's the theory of flat tyres.

One thing about the Doc. is that he gives credit where credit's due. He always kept telling the class how much Engineers know about electronics and even went and changed his system of units from the Gaussian (c.g.s.) to the rationalized M.K.S. system. It seems that this particular Doc. has a brief knowledge of French and soon found a pen pal in R. OLESNICKI, who used to write him notes before the lecture started. However, one morning while writing his love letter to the "cold blooded Englishman" or a better translation "bloody cold Pom", Dr. Mackenzie, Doc. came out of the side room and watched him write it—caught! But what! no smacks on the hand or an imposition of writing one hundred times, "I got my broad shoulders from swimming in my youth". PROF. CARVER—a cunning lecturer. He plays it safe by lecturing material that no one knows anything about and therefore no one can contradict him—not like Mackenzie; he continually got pulled up over his lecture material.

DR. SUTTON—the Dude. A very well liked lecturer, even more popular because of his lecture on Prosh Day. He speaks so well in a lecture that everyone sits back in awe; well, nobody seems to get informative notes. Besides, who wants to copy out Jenkins & White.

DR. EDWARDS. What a man! What a lecturer! The only one who can use two boards at once and also find a bit more room to go back and fill up gaps in his notes. He must be trying out a new method of lecturing—you write down one line, then leave three lines, then the next line; then, about half an hour later, we will come back and fill in the other three lines. This is definitely an effective way of lecturing—you get the messiest notes at the University. Another particularly bad habit of his is asking students questions during the lecture. Why can't he let them sleep in peace?

Physics pracs. would be the biggest farce out. They have a great system of marking the roll. Chubby Horton goes around at any time of the period and finds out who is present. It's quite possible to have done a lot of experiments yet be "statistically absent".

Week-end papers are in the usual traditional Physics style with the attitude of "don't give them too much information or else they might get the problem out".

E.D. & D.

I still can't get over the incident where Doble came into a prac. last year and started yelling out, "Is McHunt here? Where's McHunt? Does anybody know I. McHunt?" Little did he realise that there was a joke being played on him. I suppose he thought that everybody knew I. McHunt.

The main joy about the subject this year is the continual change of lecturers and tutors.

STRENGTH!

I try not to stay on Civil subjects too long, but they tell me that the Flick men haven't been called in yet to exterminate the creepy Crawley still wandering around the Civil Department.

The main student activity this year was the 4th year Elecs. versus Final year Elecs. football match. We won by two points (6.10 to 6.8), the final years never got in front throughout the match. The stars in the fourth years were the backbone of the team. Those who shone were G. KRIEVS, D. CLELAND, and S. MAKRIS, even though we had trouble fielding a team, it was good to see fellows like LING and QUAN, who had never played football before, coming out and having a game. We hope there will be another match next year, but we would like the reverse results as all the 4th years will become final years next year—brilliant deduction! (We like to think they will all be final years, anyway.)

We had our share of Inter Varsity representatives this year. D. CLELAND in Athletics, J. VASSOS in Soccer and P. KEANE in Rowing. Congratulations go to these 4th years and any others that I didn't hear about. It's quite an achievement to be able to spare the time to train for these sports and gain selection—especially for an Engineer who has negligible spare time.

It was good to see the B.Sc. men swell our ranks this year and if I ever get my degree I hope I am as proud of it as K. WANG is of his B.Sc.

I was quite disappointed to see J. TWINING at the Engineering Ball with long trousers on. But I suppose he has to draw the line somewhere. It's OK to wear shorts when the temperature is about 48 deg. F. but who ever heard of a dinner suit with short pants—maybe next year?

There were only six fourth years at the dinner this year but they all had a good time and did a bit of fraternizing with the staff, who, incidentally, all turned up.

M. SCHEMEZSKO played it real quiet in the first term this year and nobody realised that he was getting married in the May vacation. Congratulations, Mick!

Another one to shine in his own field of sport was ex-Whyalla man, G. DICK, who went quite well in the S.A. Amateur Golf Championships.

I don't know what the theory behind it is, but C. WINKLER doesn't know how to put his glasses on properly yet. He is probably that used to seeing a glass upside down that he puts his own glasses on that way by force of habit.

It's funny how stories get around, but I heard a story as told to a friend by a friend that we have quite a drinker in our midst. It seems as though the man in blue found him in a very unfit state one night and he made quite a mess of things. Apparently the magistrate wasn't very impressed either.

Junior: "Daddy, what is the person called who brings you in contact with the spirit world?"

Daddy: "A bartender, my son."

Professor: "A fool can ask more questions than a wise man can answer."

Student: "Hah! No wonder so many of us flunk our exams."

Don't worry about finding your station in life. Somebody will be sure to tell you where to get off.

Many wives complain that when a husband works like a horse all day, all he wants to do at night is hit the hay.

CLASS NOTES--FIRST YEAR

A brief extract of comments summarizing the highlights of Engineering I follows hereunder:

(1) "Doble had 150 'errs' that lecture."

(2) "What's the next lecture?"
"Engineering."
"Not worth worrying about then—come an' have a game of snooker."

(3) "Do yer statics?"
"Nah! waste o' time!"

Is this the extent of Engineering I? Of course not! My student status does not permit me to criticize in such a maligning manner, without confronting the reader with a more veritable account of the other side and demonstrate the untiring enthusiasm which was evident throughout the year; yet another comment must be used.

"Sign for us at Engineering tut today?"

"No! not going'. But I'll get Bert to sign for yer."

"Okay, an' get 'im ta sign fer John an Fred while yer at it."

Surely there is a third side you must ask? No —I'm afraid there are many more sides to this subject. In fact Eng. I is what one might call a "polygonal subject". Complex in its nature and structure, it perpetuates an insidious and awful nervousness in the Uni. newcomer. Further enhancing this inner holocaust are a group of dominating, sadistic and dictatorial bipeds, known as lecturers. Each inserts his own syringe of the deadly horror serum into the student until he has him under his hypnotic control.

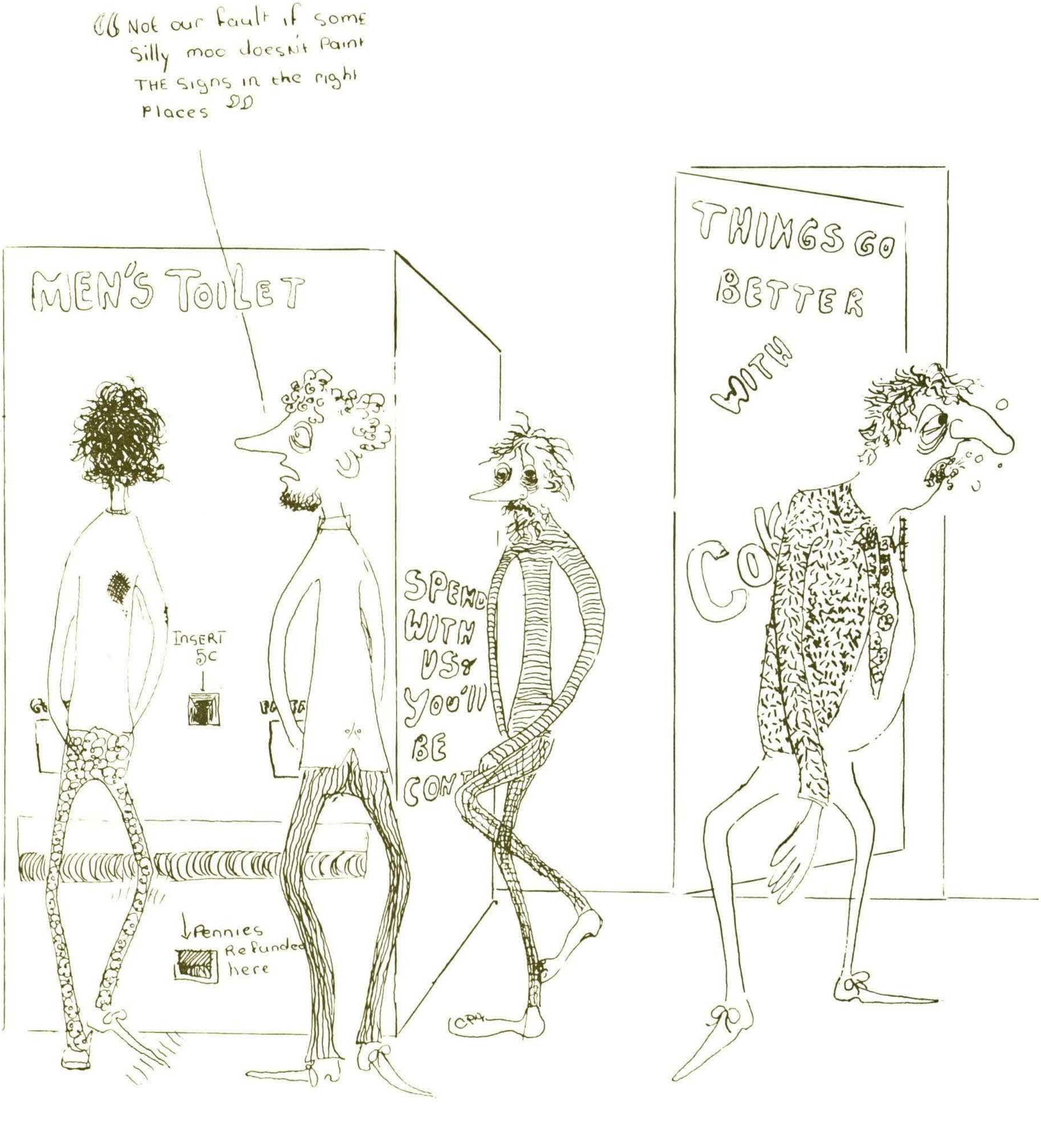
(1) Graphics—Mr. Doble's syringe has a curious effect indeed. Foaming at the mouth, unprintable vocabulary and discussions on sailing seem to be the most evident symptoms.

(2) Statics—Mr. Sved Cramp in the writing hand, smashed ear drums, and a general feeling of futility seems to accompany his deadly dose.

(3) Dynamics—Mr. King. The symptoms here are extremely easy to diagnose. Since 100% of the victims appear to sleep soundly for almost precisely 50 minutes, we must assume that he uses some form of anaesthetic.

Finally, let me recapitulate a little to explain that Eng. I would not have the same *flavour* had it not been for the idiosyncrasies of the above mentioned.

No! It would have been sweet, not sour!


"Not our fault if some Silly moo doesn't Paint THE Signs in the right Places"
MEN'S TOILET
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SPEND WITH US & you'll BE CON
THINGS GO BETTER WITH
CO

AQUALUNG DIVING

Everyone is familiar with the sight of an aqualung-diver either from the screen or from an encounter with a group of these grotesquely attired devotees on some of our South Coast beaches. Perhaps not as well known as the sight of a diver is the means by which he can stay under water or the multitude of problems which can beset a person in this alien environment. The purpose then of this article is to touch on some of the physical laws governing underwater diving and their physiological consequences on the person beneath the water.

Normal atmosphere pressure at sea level is approximately 14.7 lbs. per square inch—this being the sum effect of a hundred miles or so of air above the earth. The sea on the other hand, having a much greater density, will duplicate the hundred miles of air in a much smaller distance, in fact it takes only 33 feet of salt water to do this. A balloon inflated at the surface to a volume Vo. would, if submerged to 33 feet, have a new volume Vo./2 (Boyles' Law). Subsequent depth increase would cause the balloon to have volume Vo./3 at 66 feet; Vo./4 at 99 feet and so on.

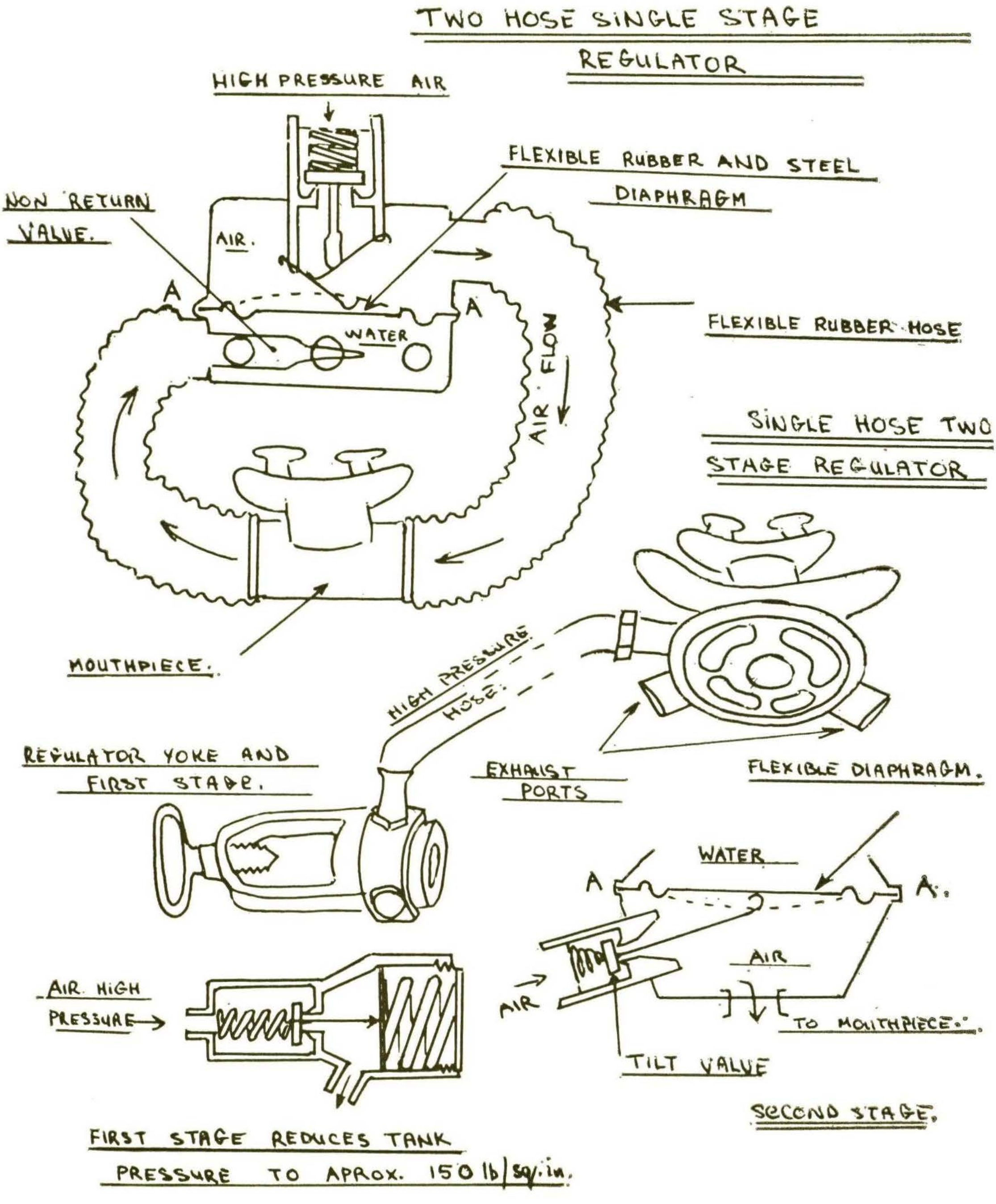
A human, if subjected to increasing pressure from the outside, will similarly exhibit a decreasing volume of those parts which are capable of compression—that is—parts containing air. Fortunately, only the lungs, the middle ear, the mouth and several cavities in the skull (sinuses), contain free air—the rest of the body being made of solid bone or fluids which are virtually incompressible.

The problem of breathing under water then is to supply air at the same pressure as the surrounding water to the lungs. A demand regulator developed in the 1940's by two Frenchmen, Gagan and Cousteau, did just this—its operating principles underlies all modern regulators and is explained further on. Water pressure on the ear drum will cause intense pain and could lead to a puncture of the membrane were it not possible to "equalise" pressures. There is a small tube leading from the mouth cavity to the middle ear. This tube is usually lined with mucous-like secretions to prevent germs entering the middle ear, and this mucous also prevents air readily passing along the tube. However, it is only necessary to pinch the nose and blow to clear this tube and hence supply equalising pressured air to the inside of the eardrum membrane. When this is done no discomfort is felt at all. A dive to any depth usually only requires ear clearing several times in the first thirty feet; after that the rate of pressure change is less and the eustachian tube as it is called remains partly open after an initial clearing. The difficulty of clearing the ears and the danger of blowing germ-inflamed mucous into the middle ear generally rule out diving for anyone with a head cold.

Since a diver is breathing air under pressure he is subject to the laws governing its component gases when subjected to pressure. Normal air contains approximately 20.9% Oxygen, 79% Nitrogen, 0.03% Carbon Dioxide plus various trace gases of lower concentrations.

Oxygen is the gas which normally sustains life. Under most conditions on the surface 100% oxygen can be breathed without harm, being used in nearly that concentration in oxygen tents and inhalators. Under water, however, if breathed under twice the surface pressure (corresponding to 33 feet), pure oxygen is toxic, resulting in convulsions and death. This behaviour of oxygen under pressure was not known for many years and resulted in deaths of many pioneering divers who were developing pure oxygen under-water breathing apparatus. It is for this reason that only compressed air is used for aqualung diving. The oxygen content of air being 20% would not become toxic until a depth of 330 feet which corresponds to a partial pressure of approximately 30 lbs. per square inch of oxygen (Dalton's Law). Well before reaching a depth of 330 feet other problems would arise, hence the normal aqualung depth range is much less than this. It may be well to mention that pure oxygen rebreathing apparatus is used for special work in shallow water, namely the services. In an oxygen rebreathing system the exhaled breath is repurified with caustic potash and no tell-tale bubbles are expelled, hence its limited military use. The use of pure oxygen systems requires so much specialised training and supervision that it is not used by any public diving club.

Increased pressure also causes an increase in the rate of absorption of soluble gases (Henry's Law). Nitrogen, a very sparingly soluble gas in tissue fluids, causes the well-known diving disease of the "bends" and another temporary condition variously described as "rapture-of-the-deep" or "nitrogen narcosis". Although only sparingly soluble nitrogen, when under pressure, will slowly dissolve into tissue and blood fluids. The amount of dissolved nitrogen being proportional to the pressure, i.e. depth and the time spent on that depth. If after a long stay at a great depth the diver quickly ascends, the nitrogen in his blood and tissues cannot come out of solution and be exhaled away sufficiently fast. The result of the reduced pressure causes minute


TWO HOSE SINGLE STAGE
REGULATOR
HIGH PRESSURE AIR
FLEXIBLE RUBBER AND STEEL
DIAPHRAGM
NON RETURN
VALVE.
AIR.
A
A
WATER
FLEXIBLE RUBBER HOSE
AIR FLOW
SINGLE HOSE TWO
STAGE REGULATOR
MOUTHPIECE.
HIGH PRESSURE
HOSE.
REGULATOR YOKE AND
FIRST STAGE.
EXHAUST
PORTS
FLEXIBLE DIAPHRAGM.
WATER
A
A.
AIR
AIR HIGH
PRESSURE
AIR
TO MOUTHPIECE.
TILT VALVE
SECOND STAGE.
FIRST STAGE REDUCES TANK
PRESSURE TO APROX. 150 lb/sq.in.

bubbles of nitrogen to form in the blood and tissues—these bubbles can block capillaries in the brain, causing death or at least paralysis of parts of the body. The common analogy is a bottle of lemonade (or beer for that matter), for when opened the carbon dioxide which was kept in solution by pressure escapes by forming bubbles in the liquid. A unique story comes to light that depended on this. In North America after a tunnel had been completed under a river the town's gentry gathered in the tunnel to cut the traditional ribbon and pass around the glasses of champagne. As it is the normal practice to pressurise under-river excavations to limit water seepage into the tunnel during construction, this opening ceremony was conducted in air at 30 lbs. per square inch. Several passed the comment that the champagne tasted a little flat, but this did not daunt them in their consumption. When taken through the air-locks to the surface the champagne in the officials' stomachs was exposed to approximately 15 lbs. per square inch. The result was spectacular, champagne literally foamed out of their ears. After composing themselves, a few bystanding workmen took the spluttering officials back into an air-lock and increased pressure to drive back the carbon dioxide into solution, then slowly reducing the pressure back to the atmospheric.

In a similar manner a diver can, if quickly taken to a compression chamber, be relieved from the symptoms of the bends. In normal aqualung diving the size of a single compressed air bottle is the safety factor as far as the bends go. Because air you breathe at depth is at a greater pressure, one lungful of air at 99 feet corresponds to four lungfuls of atmospheric pressure air and so on with change of depth. This means that a bottle of air will last less time the deeper the diver goes. The standard single bottle contains about 72 cubic feet of air. In the open air this will give approximately 100 minutes of breathing, at 33 feet the air will last approximately 50 minutes, at 66 feet approximately 33 minutes, etc. Since the amount of nitrogen which can dissolve depends both on depth and time, a bottle of air can be made such that no matter to what depth the diver goes he will always exhaust his air supply before he gets enough nitrogen in his tissues to cause the "bends".

The other nitrogen-induced phenomenon is due to the anaesthetic action of nitrogen. At low pressures nitrogen is neutral, but at about five atmospheres approximately 150 feet its effect is similar to nitrous oxide (laughing gas). A person so effected behaves like a drunk, but is in the far more likely position of doing harm to himself. The effects disappear without any after-effects by rising to a shallower depth. Nitrogen narcosis sets the limit for sport diving which is generally considered about 130 feet. By using special breathing mixtures, namely replacing nitrogen by helium and reducing the oxygen content, simulated dives have been made to over 1,000 feet.

Aqualung bottles or "tanks" are high pressure vessels made of special alloys and require annual inspection. Hydrostatic tests are necessary every five years. Air is contained at a pressure of approximately 2,200 lbs. per square inch when full—a potential bomb if a bottle should break when full, hence compulsory inspection and testing to Australian pressure vessel standards. The demand regulator reduces the highly compressed air in the bottle to the ambient pressure of the water at the diver's depth. This reduction being accomplished in one, two, or three stages depending on the make and price tag of the regulator.

The above listed principles of diving serve only as an outline to the wealth of diving knowledge which has accumulated in the last thirty years. Anyone contemplating diving is strongly advised to learn through competent, qualified instructors. Lack of knowledge may kill. All the diving maladies are preventable—except for a chance in a million of unexpected equipment failure—diving is as safe as playing bowls. Even equipment failure becomes a small risk to a well-trained diver as ascents from 100 feet can be safely made on one breath and no panic.

Those that venture beneath the water find there another world. The feeling of weightlessness, the beauty of the underwater world, cannot be described—it must be experienced to be believed.

Refer to the diagrams of two types of regulator commonly in use today. The operation principle is the same in both cases. In the one stage regulators very high pressure air is reduced to breathing pressure in one step. The other regulator does the change down in two steps and hence can be set for easier breathing. Both regulators have a flexible diaphragm AA which divides the regulator body into two compartments, one dry the other exposed to the water. On inhalation the diaphragm is inflexed inwards and by means of some lever linkages causes air to flow to the diver. On exhalation the breath is expelled into the water. To prevent water entering into the breathing chamber via the exhaust ports, they are fitted with some form of non-return valve (usually rubber diaphragm). The regulator body, springs, etc. are all made of non-corroding metals usually chromed brass or stainless steel.

Sadist: A person who locks the bathroom door the night of a grog show.

RESEARCH IN CHEMICAL ENGINEERING

by Dr. M. J. Messenger, Lecturer in Chemical Engineering.

The research interests of the Department of Chemical Engineering have continued to diversify over the past year. Research is currently being carried out on heat transfer to boiling two phase flows, the fluid mechanics of film flow and of entrained two phase flow, the setting of solids through fluids, the dynamics of packed bed reactors, and the design and fabrication of an analogue digital, digital analogue conversion system. Other current research interests include various aspects of the field of bio-medical engineering, and studies of the deformation characteristics, corrosion behaviour, and the internal friction characteristics of the metal zirconium.

Two phase flow, the flow of gas and a liquid (entrained or as a film) together in a closed channel, is of considerable practical importance. Such flow occurs in both nuclear and conventional steam raising equipment, in evaporators and in condensers, and in oil and geothermal wells. Until recently, two phase flow studies constituted the majority of research work being carried out in this Department.

Climbing film two-phase flow, that is vertically upwards flow which is induced by vaporization of a fraction of the liquid fed into the base of a heated channel, is currently being investigated in a channel of annular cross section in which both surfaces are being heated. Local heat transfer coefficients are being measured and high speed flash photography is being used to elucidate the mode of flow.

Adiabatic falling film flow of air and water in a long vertical glass tube is being studied. The liquid flow has been found to be dominated by slug-like disturbance waves. Cine photography and a sampling probe are being used to investigate the mechanism by which droplets are torn from the liquid waves on the tube wall and are carried into the gas stream.

Other work is proceeding on the general study of the mechanics of a liquid film moving under the influence of an interfacial shear stress imposed by a gas stream moving parallel to it. Currently the stability of the gas liquid interface toward self-generated disturbances is being examined, and preparations for the measurement of energy fluxes to such disturbances are in progress.

The settling of solids through fluids is another research interest. Experimental observations of the spatial distribution of uniform particles settling slowly through a liquid have been made, and have indicated a random spatial distribution. Theoretical treatment of the settling of random spatial distributions of single species and two-species solid particle systems to calculate settling velocities is in progress.

Other work in settling has involved the measurement of concentrations in two-species sedimenting systems at a given depth as a function of time. The concentration of both species has been determined simultaneously by radioisotope methods with the use of both attenuation and tagging methods. Concentration-time curves have been prepared and the initial velocity of both species has been calculated from these. It was found that under certain conditions negative velocities may exist. Velocities will be compared with those predicted by a mathematical theory for a random three-dimensional continuum suspension model.

The dynamics of packed beds has received continued attention. Theoretical models have been derived to describe the transient response of non-reactive packed beds in which resistance to heat and mass transfer between gas and solid, diffusional resistance within the particles themselves, and so-called longitudinal dispersion in the gas phase is present. This model has particular application to the design of packed bed absorbers, regenerating heat exchangers and to gas chromatography. The application of terms to describe heat generation within the individual particles has application in the study of the "pebble bed" type of nuclear reactor. When equipment is completed dynamic tests are to be carried out by the application of a heat pulse, with analysis by means of the Fourier transform and "moments analysis".

An analogue digital, digital analogue conversion system to be linked with the CIRRUS computer has been designed and has been converted into circuitry. In addition to its use for the study of digital control systems, this system when completed will be used for data logging of transient phenomena, in particular for the project on the dynamics of packed beds.

In the field of biomedical engineering, work has been carried out on the construction of analogues for the prediction of the occurrence of decompression sickness. This follows up previous work on a thermodynamic theory of decompression sickness which was tested successfully during a recent visit to the Royal Naval Physiological

Laboratories in England. Other work has involved the estimation of blood flow by isotope eliimnation and theoretical and practical aspects of the estimation of oxygen tension in tissue. Another interest is the modification of polymers to obtain selective membranes which are impermeable to protein and which display many of the other properties of the membranes in the kidney.

Three main avenues of research, each concerned with the metal zirconium, are being pursued by the materials science group.

Zirconium metal is used extensively as the basis of special alloys for nuclear reactors, and a knowledge of its friction characteristics is vital to this application.

The mechanism of deformation in zirconium is being investigated by thin foil electron microscopy of stressed sheet metal. Preparation of thin foils for this study is a problem of controlled corrosion and this aspect is the second of this group of projects. Thirdly, apparatus is being constructed at present to examine the internal friction charactertics of zirconium by torsional decay.

AUSTRALIAN RULES FOOTBALL

"Now that me and Guisseppi we is nationalized we think that maybe we should see the football, which it is the sport all Australians watch.

"So we goes to the football ground, when we is all made into sardines. Two mobs wearing ski jumpers comes rushing onto the ground and run around it picking up grass. Also comes onto the ground the fella what owns the ball. He is called many things by the sardines, but mostly he's is called Yamug.

"Two guys called captains they go off together and have a game of two-up. When they tell Yamug the result, he gets mad and throws the ball away. The crowd she roars and I yells 'Kill the mug,' at which one big bloke with straight hair called Curly, kicks Yamug's ball at two flag poles and when the crowd she roars again, a poor fella in a white coat waves two white flags to surrender, but they keeps attacking him till goes the air raid siren, and they all go home.

"As we leave, I says to Guisseppi, 'We better not bring any money next time we comes'. I says because as we leaves I hears men leaving and saying we wus robbed."

Careers with C.R.A.

Positions that matter

The prosperity of our nation depends greatly on the mineral industry which offers firm, secure employment in a wide variety of interesting positions.

The Conzinc Riotinto of Australia Limited (C.R.A.) Group has important mining and industrial interests throughout the Commonwealth and in its operational and development work is doing much to open up remote areas. This aspect of its activities should have special appeal to ambitious, dedicated young Australians who want to occupy positions that really matter.

The C.R.A. Group includes operational units which are internationally recognized as leaders in their fields, and offer many avenues of employment at professional level. C.R.A.'s rapid expansion during the last decade or so has resulted in large numbers of trained men being required both in the operational, accounting and service fields. Opportunities for promotion are great, and some of the categories of staff that C.R.A. are seeking are as follows:

Mining Engineers

Few companies mine as many different minerals as the C.R.A. Group. In addition to mining at Broken Hill, the Hamersley Ranges, Weipa and Rum Jungle, mineral sands are dredged on North Stradbroke Is. (off Brisbane). Each of these operations presents its own problems, its own challenges and provides in consequence a storehouse of experience for those working there. The work is in good conditions and modern machinery and methods are used. Young engineers on appointment serve periods in different departments and, aided by further instructional courses, can quickly be promoted to responsible positions.

Metallurgists & Chemical Engineers

Metallurgists and chemical engineers in the C.R.A. Group are concerned with the treatment of ore, the recovery of its metal content as efficiently as possible, and with research. The range of opportunities is wide, and as operations develop and extend, the range will be increased further. Metallurgists and chemical engineers also participate in research and development, which are activities on which C.R.A. spends large sums each year.

Geologists

The C.R.A. Group is very active in the search for new mineral deposits in all States of Australia, in the Territory of Papua/New Guinea and in the surrounding areas. Field geologists explore the territory, using the latest techniques, then test promising areas to determine the extent of ore bodies. Two outstanding examples of C.R.A. discoveries are the bauxite deposit at Weipa and the Mt. Tom Price iron ore deposit in the Hamersley Ranges. Extensive proving work is also being conducted on a major copper discovery on Bougainville in the Solomon Islands. In established mines such as Zinc Corporation and New Broken Hill at Broken Hill, at Rum Jungle and Mt. Tom Price geologists determine the characteristics of the ore bodies and help plan their extraction.

Other Requirements

C.R.A. also has vacancies in other professions, each providing satisfying and rewarding employment, such as civil, mechanical and electrical engineering, accountancy and economics, agricultural science and forestry.

C.R.A. as an Employer

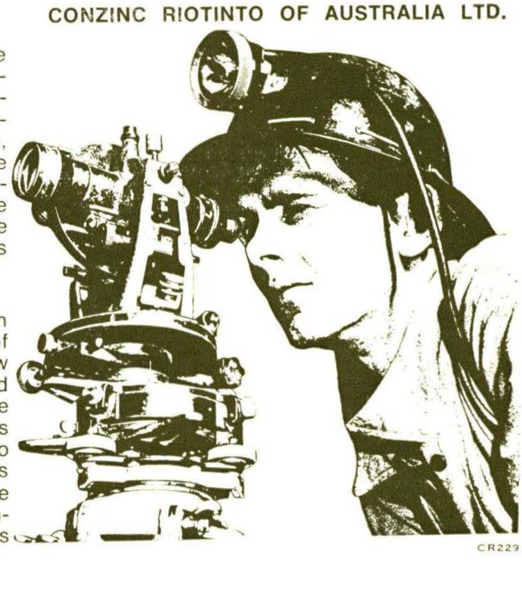
The salaries paid to C.R.A. staff members compare favourably with general industry standards, and are in accordance with qualifications and experience. The benefits provided by the Group are substantial, among them being non-contributory provident fund for male permanent members on reaching 21 years of age; annual leave which varies between three and five weeks according to location; insurance and medical plans; even housing finance in some cases.

Some of C.R.A.'s mining operations are in remote areas of Australia, but employees required to work in these places can expect living conditions and amenities not far removed from those in the capital cities.

Applications

If you would like to work for C.R.A. in any of the categories mentioned, either having qualified or studying in these fields, you are invited to write for further information to the Chief Personnel Officer, Conzinc Riotinto of Australia Ltd., Box 384D, G.P.O., Melbourne, 3000.

CONZINC RIOTINTO OF AUSTRALIA LTD.



CR229

RESEARCH ACTIVITY IN THE MECHANICAL ENGINEERING DEPARTMENT

by Professor H. H. Davis (Professor of Mechanical Engineering)

Thermodynamics

Heat transfer studies are continuing in various areas including convection with vibrating bodies and in the combustion chamber of an i.c. engine. Sophisticated electrical measuring and data processing techniques for dynamic temperature studies have been developed and used on a variable-compression research engine for determining heat transfer coefficients from gas to walls.

Environment control for biological research has been advanced by a new approach to fine tolerance, wide-range control of temperature and humidity. A system has been patented and developed for the Waite Institute for agricultural research.

Gas Dynamics

A research wind tunnel is nearing completion for fundamental studies in boundary-layer pressure fluctuations. Noise generated by this phenomenon is a problem in many flow systems including air ducts and aircraft fuselage surfaces. An adjustable flexible wall allows control of pressure gradients in the tunnel.

Another research wind tunnel is nearing completion for fundamental studies in the mechanism of sound generation from the flow over aerofoils and cascades. The project's aim is reduction in noise generation from all aerofoil-type rotors in fans, propellers, etc.

Air lubrication in bearings is a continuing project with emphasis on a patented tapered-land configuration which shows promise for increased stability and less demanding manufacturing tolerances for journal and thrust types. Applications from miniature dental drills to large industrial grinder journals have been developed for proving and the small air turbine driven units have been run up to ½ million r.p.m. with good load torque characteristics.

Pressure-drop in pulsating-flow pipe systems and attenuation of shock-waves in pipe and muffler systems are under study. Schlieren optical apparatus has been made up for visualisation and photography of shock waves in transparent models with variable internal organs. One aim is the development of high-attenuation, low back-pressure compact mufflers for 2-stroke i.c. engines.

Hydrodynamics

A long programme of marine propulsion studies has included the full-scale and water tunnel measurements of the severe vibratory components of thrust, torque, bending and pressure field developed by a propeller in the asymmetric wake from a ship's hull. Elimination of vibration by ducted impellers or submerged hydrojets of high efficiency has been studied in the research water tunnel and a new approach to computerised design of ducted impellers put forward is now in use in many countries. This aspect has now temporarily lapsed due to the "team" moving to N. America.

A new phase of water-to-air hydrojet research has been initiated in association with the promising application to high-speed marine surface craft. Work on model and manned air-lubricated hulls and side-wall hovercraft hulls is proceeding in towing tank and free water tests, with radio control and telemetering being developed for the unmanned models. (Note: 4,000-ton 100-knot oceangoing, heavy load carrying, long range, air-supported surface craft are under development in U.S.A., with water/air hydrojets as the most promising propulsion system.)

Dynamics of Machines

Vehicle suspension dynamics is being studied with a view to optimising the response of body and axle for an independent suspension unit. Body motion control (comfort factor) and axle motion control (wheel-hop or safety factor) can both be influenced by feed-back control of the main spring damper. An electrically controlled magnetic fluid damper has been developed and appropriate control signals from body and axle response modified and fed back for damper control. Mechanical and electrical analogue studies and a vehicle rig have been used to determine control parameters, and a control system is being developed for meeting the varied requirements for primary and secondary system responses over the range of harmonic, impulsive and random disturbances.

A range of problems in vibrations and acoustics is being investigated. In addition to flow-excited vibrations, aerodynamic flow noise, and shock-wave control in engine exhaust systems mentioned under Gas Dynamics, work has proceeded on fan noise, engine silencers of low back-pressure, wind-excited chimney stack vibration control, anechoic wedge characteristics, reverberation chamber scatterers, and absorption and transmission of sound in and through materials and composite panels.

RESEARCH IN ELECTRICAL ENGINEERING

by B. R. Davis

The current research in electrical engineering covers the spectrum from low frequencies through medium and radio frequencies up to microwave frequencies.

At the low frequency end, the field of energy conversion covers such topics as static AC-DC converters and the asynchronous reluctance motor which has particular promise in its linear oscillating form.

A number of topics can be grouped into the classification of control engineering. There is research on the dynamic control of complex systems such as those with distributed parameters and the effect of interactions between control loops in multivariable systems. A particular example being studied is the effect of control elements on power system behaviour under the abnormal conditions of asynchronous operation. This is of interest in the Port Augusta-Adelaide power system. The principles of self-organising systems have been applied to teaching machines in which teaching strategies are altered adaptively to suit the progress of the student. Studies of fields of electrical activity in the olfactory cortex of the cat brain are being undertaken in an effort to unravel the links in the olfactory control system.

Higher up the frequency scale comes research in digital techniques, such as the problems associated with high speed logic, particularly with reference to high-speed analogue-digital converters. There is also a study of computer aided circuit design involving graphical and symbolic interchange of information between man and machine.

Digital techniques has also influenced the field of communications. One instance is the need for digital data transmission at high speed and accuracy from one point to another. This problem is at present under investigation. Another is in the generation of pseudo - random binary sequences which have properties similar to white noise and many advantages over its use as a test signal in communications systems. This field, of particular interest to the P.M.G., is also being studied. Other communications research involves the study of analogue systems such as the phase locked loop and the feedback frequency modulation system.

There are several projects on different aspects of antennas and propagation. A study of aircraft landing and navigation systems and the associated antenna requirements is under way. On the propagation side there are investigations into the effect of meteorological conditions on long distance ground wave propagation over sea water and also the effect on microwave links. The problem of optimising the tracking behaviour of large steerable antennas is also being studied.

In the microwave region there is a study of adaptive active antenna arrays applied to microwave links, with particular reference to the P.M.G.'s East-West Microwave System. Also of interest are the microwave properties of materials, particularly semi-conductors at high magnetic field strengths and low temperatures.

CRAPICS (A SERIES) OF LECTURES ON LIFE

Caused by the rapid increase of promiscuity among students, various steps have been taken to educate those concerned about the mishaps which could be encountered. "On Dit", for example, have printed articles on contraception, free love, and Gallup poles upon the probability of being seduced at University.

Concerned about this problem and forseeing many traits which could, and inevitably do, face those involved, the University sought Dr. William Devon Moble. (B.ERRS.), well known in the fields of "non-intersection, bearing and boat-building". His series of lectures covered "Producibility, through "Selection of Fits", to "Applications".

He began with a simple and explicit statement, "Remember the fundamental form of the construction that follows." He continued, and from time to time wrought explanations to "length of stroke, end views" and "position". To present facts more easily, he referred to charts. These, he said, were "results from test data obtained in experiment, and correlate observations of natural phenomena".

During practical sessions he emphasised the importance to "work up a routine" and not to get "confussed". By the use of a model and a plastic box, he was able to show why "we rotate the object about a suitable axis, keeping a point fixed" and the "surfaces generated by the motion of a line". He mentioned later though, that in "practice we deal with more complicated forms".

His lectures, I believe, were highly successful, and expounded the true spirit common to many students. Concise and explicit, with the exception of the occasional reference to sailing, suicide and swimming with one's clothes on, he achieved something rare among lecturers. I was healthily enriched by them and intend following the course again next year.

William R. Phillips (Mech.).

RESEARCH IN THE CIVIL ENGINEERING DEPARTMENT

The following are the research activities in the structural section.

An investigation carried out by Barry Tozer showed that structures can be designed by computer for multiple loading with prestress. Using general theorems that apply to the "shake down" of elastic-plastic structures, this investigation solves the problems of minimizing structural weight without actually manufacturing the members to the close tolerances that would be required for the prestressing.

A research project carried out by Doug Treloar gave interesting analytical results on the buckling of some three-dimensional structures—results that are in good agreement with experimental values.

Current structural research is concerned with the behaviour of brick walls on flexible foundations, the design of very large concrete tanks, and the dynamic characteristics of certain structures.

The load-carrying capacity of many structures can only be evaluated by determining the relationships between the loads and the deformations in the post-elastic range. For three-dimensional structures in which the members carry combined triaxial stresses, the post-elastic deformations are difficult to calculate theoretically because the behaviour of a material in the plastic range is extremely complex and not amenable to simple mathematical formulation. Currently, an investigation is being conducted into the elasto-plastic behaviour of members carrying combined stresses. Theoretical predictions for the stresses, strains, and deformations have been obtained with the aid of a digital computer, and the results have been verified experimentally from tests on members carrying combined tension and torsion and on members carrying combined moment and torsion. At present, a servo-controlled testing machine is being built to extend experimental aspects of the investigation.

An investigation is being made into the increase in load-carrying capacity of tube columns by filling them with concrete. The ultimate strength of concrete in triaxial compression is greater than for an unconfined axial load. The restraint imposed by the tube thus further increases the load capacity.

The recently introduced rectangular section (RHS) does not restrain the concrete as effectively as the circular tube, but axial load tests carried out so far indicate a 30%-50% increase as compared with the unfilled section.

It is hoped to establish a criterion for the design of such composite columns for inclusion in the Australian code for Concrete in Buildings (CA2).

Materials for these tests have been supplied free of charge by Stewart & Lloyds (Distributors) Pty. Ltd., Australia.

Hydraulic activity has ranged from basic fluid behaviour studies to large-scale investigations. Three research studies being currently pursued are density current flow in porous media, the effects of pressure noise on jet dispersion and stagnation temperature effects in low velocity water flow, all of which are yielding interesting results. The first problem arose out of underflow problems associated with the Chowilla Dam, the second from jet dispersion studies of irrigation and fire nozzle jets, and the third from an interesting thermodynamic procedure for measuring pump efficiency by "taking its temperature rise" (to 0.0001° F.).

Model studies were conducted for the Engineering and Water Supply Dept. of the new Kangaroo Creek Dam spillway, and these resulted in an estimated saving of $750,000. This model has now been removed from the model bay and the first pilot studies of part of the metropolitan coastline are now being prepared as part of the Beach Erosion Research Activity. From low-level aerial photographs, from extensive sand sampling together with other studies, a pattern of behaviour of the beaches is beginning to appear, and this work will further test these expectations. A large-scale investigation study is also drawing to a close and demonstrating the close relationship between watering uniformity and yield; a matter vital to the design of economic irrigation systems. In this work and in the Beach Erosion Studies, the computer has played an important part.

The soils section of the Civil Engineering Department is at present engaged on a wide-scale investigation into the physico-chemical and structural characteristics of the clays of the Adelaide Metropolitan Area.

Two final year student-projects involve studies of the thixotropic properties and swelling characteristics of a typical fissured clay while a post-graduate project deals with the strength characteristics of partially saturated clays. In addition a study of the fabric of local clays has been started, using ultra-thin sections for electron microscopic examination.

PIET HEIN

The planning of the $1,780 million Stockholm project had come to a stop. The multi-level plaza which was being built on the site of the former crowded city centre was a stunning concept. It included a sunken island, fountains, shops, and restaurants. However, the stumbling block was in the manipulation of the traffic that would come swirling in and around from the city's main streets.

None of the planners knew what to do. A simple circle would not do because the space to be filled was rectangular. An ellipse wasted space in the corners, and its end curves were too sharp for fast traffic flow. A modified ellipse was proposed, but when architects tried to duplicate it in smaller concentric shapes within the plaza, they met with distortions that produced an unharmonous effect.

The architects then did something which was most irregular, they sought the assistance of a poet. No ordinary poet mind (should there be such a thing as an ordinary poet), for Piet Hein is as much scientist as artist. On hearing the problem encountered, he suggested "a curve that mediates between the circle and the square, between the ellipse and the rectangle", and he prescribed a curve "with the same equation as an ellipse but with an exponent of $2\frac{1}{2}$". It should be noted that a straight line is a first degree curve having an exponent of one. A circle or ellipse has an exponent of two. And hence a curve with an exponent of $2\frac{1}{2}$ is tending to a square or rectangle.

In a matter of days, Piet Hein produced (with the aid of a computer) the calculations for drawing a curve with an exponsent of $2\frac{1}{2}$ to fit the specific rectangle in Stockholm. When reduced in size for the smaller concentric shapes, the curve remained harmonious. "It had unity, like a piece of music," says Hein.

But it was more than just this, it was a revolutionary shape; a shape never before used; a brand new curve, as valid mathematically as the circle, square or ellipse and yet different. Piet Hein called it a "super ellipse".

Today this shape is universally recognised. There are "super elliptical" tables which save 15 per cent. in restaurant space. There are carpets, plates, and chairs which capitalize on this shape.

Piet Hein is a native of Denmark and today his name is a household word throughout Scandinavia. He attended the University of Copenhagen, where he studied both physics and philosophy, later pursuing the lives of both artist and scientist, as if they were one. Piet Hein stands astride the two cultures of modern life—science and the humanities—contending that they are two only because we make them so.

"That gulf cuts up our world and makes a deeper cleavage than between West and East, between vegetarians and meat eaters," he says. "Of course, I see the necessity for specialization—nobody more strongly believes in the need than the person who has trespassed from one field to another. I do not dispute the need for specialization, but I don't think the way we do it is the right way. The specialist must know more of the total human activity."

He initially worked as a consulting engineer, and while in his early twenties he devised several minor but radical inventions, mainly in the optical field. The royalties from these offered him a basic living. At the same time he was writing "pensatory, philosophical poetry".

During the war, when the Germans invaded Denmark, Piet Hein was president of the Anti-Nazi Union and hence had to go underground. It was during this time that he began to write his small message-conveying poems, which he called "grooks", a name which he grasped out of empty air.

The poems were humorous and were intended to deliver subtle messages to the Danes. One of the early ones composed during the war is the "Consolation Grook".

Losing one glove
is certainly painful
but nothing
  compared to the pain
of losing one,
  throwing away the other
and finding
  the first one again.

"It said that what happens to you from outside is less important than how you take it. It is only bad if you take it the wrong way. The Danes knew what I meant."

Other grooks are:—

Here is a fact
  that should help you fight
    a bit longer:
Things that don't act—
  usually kill you outright
    make your stronger.

True wisdom knows
it must comprise
some nonsense
as a compromise
lest fools should fail
to find it wise.

Problems worthy
  of attack
prove their worth
  by hitting back.

This man, whose personal friends included such thinkers as Einstein and the Nobel Prize-winning physicist Neils Bohr, says that knowing too much—or, rather thinking that you know too much—can be a hindrance to creativity. "I work to a principle of being unwise," he says. "It helps to be unwise. But I had to develop sheer stupidity into unwisdom."

He puts this attitude into one of his most widely known grooks:

There is
one art
no more,
no less:
to do
all things
with art-
  lessness.

—Gregory Kemp.

Confucius Says:

Population explosion made up of many little bangs.

Man who eats meat and peas on same plate unhygienic.

Woman sitting on jockey's knee likely to get hot tip.

An old digger describing his war experiences to his mates:—

"There we was in the thick of battle—bullets flying, grenades shattering and mortars exploding around our ears. Two against two hundred it was—couldn't see each other for smoke—we thought the end was near. Finally we killed the two little buggers."

Figures may not lie, but girdles keep a lot of them from telling the truth.

THE CLEAN SONG

There once was a farmer who stood on a rick
Shouting and yelling and waving his —
Fist at the sailors who stood on the rock
Teaching the little boys to play with their —
Kites and their mables as in days of yore
When along came a lady who looked like a —
Decent young lady, who walked like a duck
Said she was teaching a new way to —
Educate children to sew and to knit
While the lads in the stable were shovelling the —
Contents of the stable and the hay from the rick.
While the dirty old squire was pulling his —
Horse from the stable to prepare for the hunt
While his wife in the parlour was powdering
her —
Face and arranging her vanity box
And taking precautions to ward off the —
Aches and rheumatics she knew she's not scoot
For that very night she's be having a
Sweet violets,
Sweeter than all the roses:—

WORDS

by T. A. Farrent

Words! words!! words!!!—Two pages of them —short ones like "Eh?" or lovely ones like dawn or dusk marking the times of day, or long ones like "Polysyllabrification" which Derek van Abbe told us to avoid; this is the responsibility which accompanies the privileges the A.U.E.S. so kindly gave me earlier this year in making me an Honorary Vice-President of the Society.

But words about what? Well, why not about themselves? I am reminded that over 30 years ago after giving a talk at my old school about Engineering, one schoolboy asked "What is the greatest invention?" You will notice the present tense. After some stalling for time, surely I was inspired when I replied "The Alphabet," and I find no reason to alter the answer today. It yields the bricks to make an article such as this, where, I hope, my thoughts are made known to you. For that is the purpose of using words.

Once I was perusing a Government Gazette wherein appeared a table of times of sunset for the next following after (N.B.) quarter. Following the table appeared words like this—

". . . and the above table shall be ipso facto evidence that the sun has set at the times stated."

At first sight the layman will say "How silly!" (perhaps he will insert an adjective, too), but a little reflection will show how necessary it might be in a court of law to establish unambiguously what the rule "half an hour after sunset" implies.

There is a good exercise for all undergraduates to ponder the possible meanings of such familiar phrases as "Don't Walk", "Keep to the Left" or the celebrated ". . . trade between States shall be absolutely free . . ." in our Constitution. The pity of some of the recent changes in our Courses is that an exercise of writing a specification can no longer be included. But there is no reason why you should not attempt one for yourselves. Make an attempt to write one for a haircut, short back and sides, and compare the results with others.

In my student days, two books by Stephen Coleridge helped me. They were "Letters to My Grandson on the Glory of English Poetry" and the companion volume on English Prose. They taught by case histories, an inspiring way to do. Read them, for it is by reading and practice that you will learn to write clearly and succinctly (have you a dictionary in the house?). Here is another exercise for you. Read in the Bible the events described in the passage in the Acts of the Apostles from Chapter 21, verse 40, to Chapter 23, verse 24, inclusive, but AVOID READING ON. Now describe these events in as short a letter as you can, written to a superior officer, you being the chief captain of the passage. When you have finished, read the passage on to verse 30. Were you as big a liar as the chief captain, or just more verbose?

Anybody attempting to write a technical paper will profit from a careful study of some well-written Code.

But words are spoken as well as written, and the nuances of voice can vary the meaning of a sentence. Consider "You owe me ten dollars." Say over to yourself the sentence as you read it, then repeat it, emphasizing one word alone, each time. You could proceed emphasizing two words, then perhaps three. Each time you will detect a shade of difference in meaning. Years ago an elocutionist named Steve Wicks, I think, once gave some advice to emphasize pronouns. Try it in reading either the 23rd psalm or the Lord's Prayer (Matthew 6 if you don't know). I think you will realise immediately the personal involvement.

Today computers have given us a new language of the "go" "no-go" type, or of the "um?"—"umph" type. I don't understand much of it, but it reminds me of a conversation I once had with our Registrar during a chance meeting. It went something like this.

Registrar: "The Civil Engineering Department will do that, um um??"

Myself: "Umph u-u um-umph."

in true Pygmalion style. Also today, our words are often coined from initials of organisations which also reminds me of the late Mr. Talbot Smith ending a radio talk on "Initials" in the following way.

"It is 11.15 at 5—and if I don't finish P.D.Q. you will say I am N.B.G. O.K."

But at the risk of being boring, I shall record the necessity for proper spelling (you may correct common student errors such as "schute", "guage" or "proceedure"), pronunciation ("Haitch") and grammar. Common examples of errors in grammar which you might wish to ponder are "Those sort of things," "all rocks are not granite," "Run quick" and when you become aware of it the split infinitive will grate, "To beautifully cut through slips". Style is a different matter which comes after extensive reading and practice. In most articles rewording is rewarding. This one has had only the latter.

With kindest regards,

UNCLE TAFFY.

HOW TO PLAY GOLF

My wife said to me: "George, it's about time you learned golf—you know, GOLF—that's the game where you chase a ball all over the country when you are too old to chase women."

So I went over to see Jones, and asked him if he would teach me how to play.

"Sure," he said, "You've got balls, haven't you?"

I said, "Yes, but sometimes on a cold morning they are kinda hard to find."

"Bring them along to the clubhouse tomorrow and we'll tee off," he said.

I asked: "What's tee off?" and he replied: "It's a golf term, and we have to tee off in front of the clubhouse."

"Not for me," I said. "You can tee off from there if you want to, but I'll tee off behind the barn somewhere."

"No, no," he said, "tee is a little thing about the size of your finger."

"Yeah! I've got one of those," I replied.

"Well, he said, "you stick it in the ground and put your ball on it."

I asked: "Do you play golf sitting down because I thought you stood up and walked around."

"You do," he said. "You're standing up when you put them all on the tee."

Well, folks, I thought that was stretching things a little too far, and I said so.

He said, "You've got a bag, haven't you?" "Of course," I told him.

"Well," he said, "Can't you open the bag and take one of the balls out?"

I said, "I suppose so, but I'm darned if I'm going to."

He asked if I didn't have a zipper on my bag, but I told him, "No, I'm the old-fashioned type."

Then he asked me if I knew how to hold the club. Sure I did, so I said, "Well, after fifty years I should have some sort of idea."

He said: "You take the club in both hands . . ." and folks, I knew right there and then he didn't know what he was talking about.

"Then," he said, "you swing it over your shoulder."

"No, no," I said, "that's not me, that's my brother you're talking about."

He asked me: "How do you hold your club?" and, before I thought, I said, "In two fingers."

He said: "That isn't right," and got behind me and told me to bend over and he'd show me. He couldn't catch me there though, because I didn't put in four years in the Navy for nothing.

He said: "You hit your ball with your club and it will soar and soar."

I said: "I could well imagine!"

Then he said: "And when you are on the green . . ."

"What's the green?" I asked.

"That's where the hole is," he said.

"Sure you're not colour blind?" I asked.

"No," he said. "Then take your putter . . ."

"What's the putter?" I asked.

"That's the smallest club made," he said.

"That's what I've got—it's a putter," I said.

"And then," he said, "you put your ball in the hole."

I corrected him. "You mean the putter?"

"No," he said, "the ball. The hole isn't big enough for the ball and the putter, too."

"Well, I've seen holes big enough for a horse and cart," I said.

Then he said: "After you make the first hole you go on to the next seventeen."

He couldn't have been talking to me—after two holes I'm shot to hell.

"You mean," he said, "you can't make eighteen holes in one day?"

"Hell, no," I said, "it takes me eighteen days to make one hole. Besides, how am I going to know when I'm in the eighteenth hole?"

"The flag will go up," he said.

That would be just my luck!

THE AFLUENCE OF INCOHOL

I had 18 bottles of whisky in my cellar, and was told by my wife to empty the contents of each and every bottle down the sink . . . OR ELSE!!!

I said I would and proceeded with the unpleasant task. I withdrew the cork from the first bottle and poured the contents down the sink with the exception of one glass, which I drank. I extracted the cork from the second bottle and did likewise with the exception of one glass which I drank. I then withdrew the cork from the third bottle and poured the contents down the sink which I drank. I pulled the bottle from the cork of the next and drank one sink out of it. I pulled the sink out of the next glass and poured the cork down the bottle. Then I corked the sink with the glass, bottled the drink and drank the pour. When I had everything emptied, I steadied the house with one hand, counted the glasses, corks, bottles and sinks with the other, which were 29. Then as the house came by I counted them again and finally had all the houses in the bottle which I drank.

I am not under the affluence of incohol as some thinkle peep I am. I'm not half as thunk as you might drink. I fool so feelish I don't know who is me, and the drunker I stand here, the longer I get.

A CHINESE RECIPE FOR CONTRACEPTION

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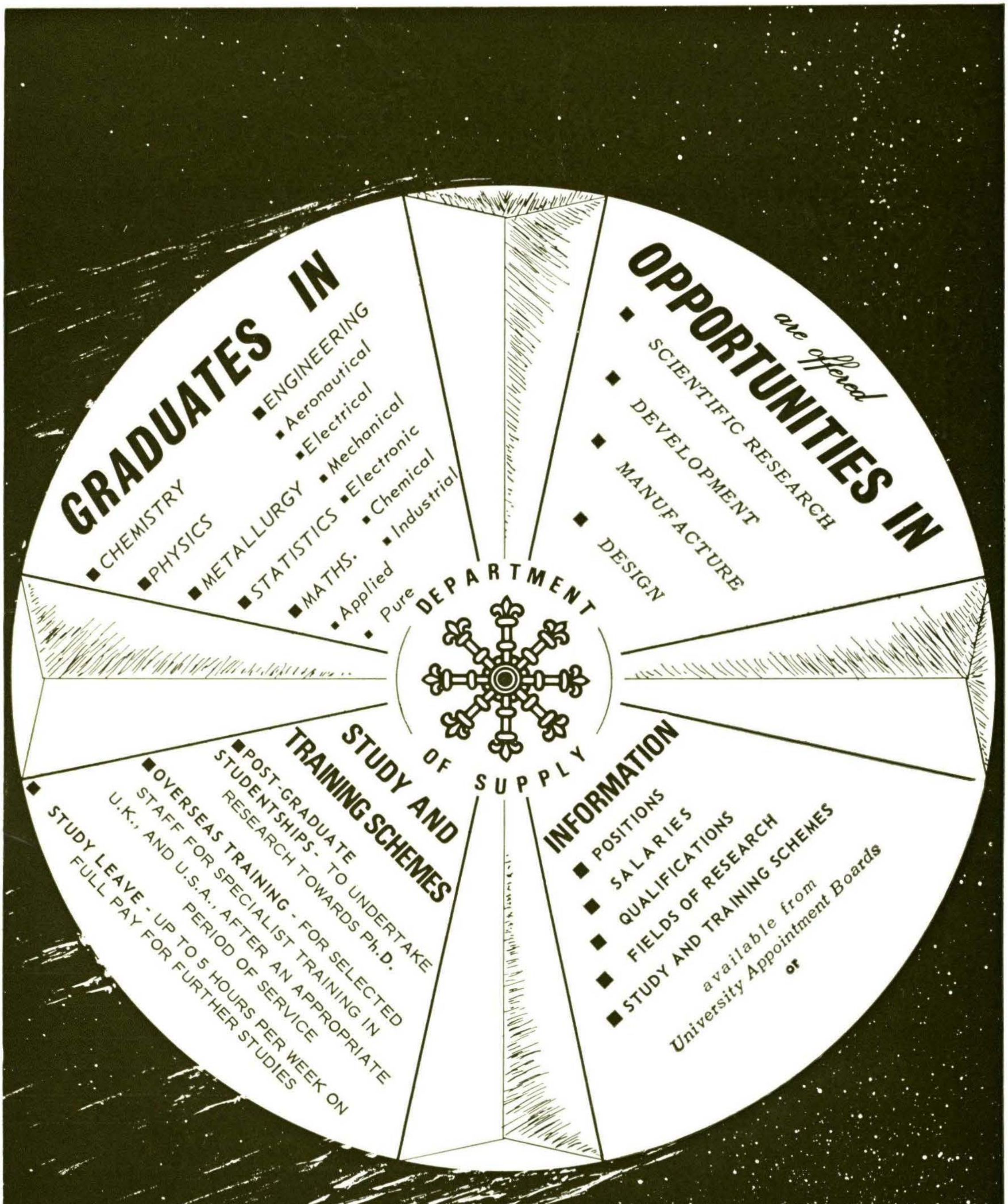
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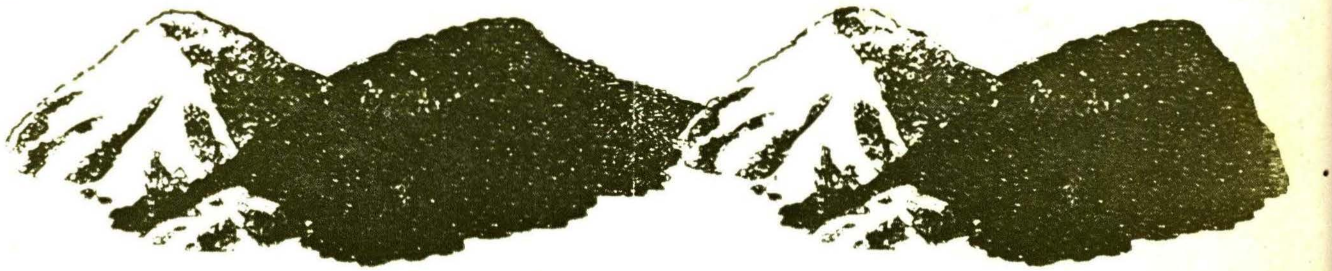

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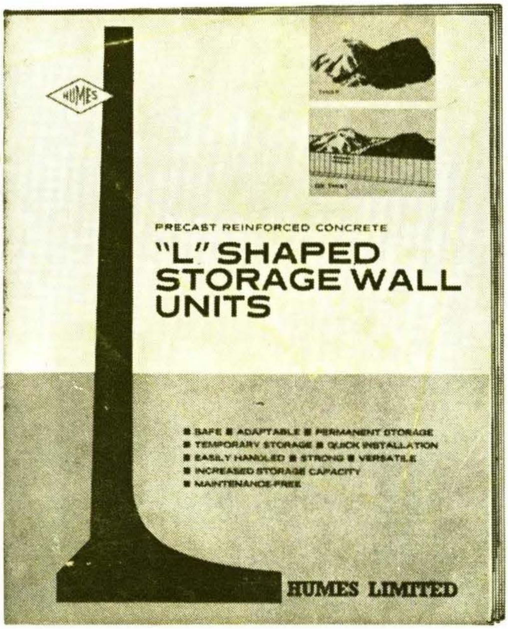

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