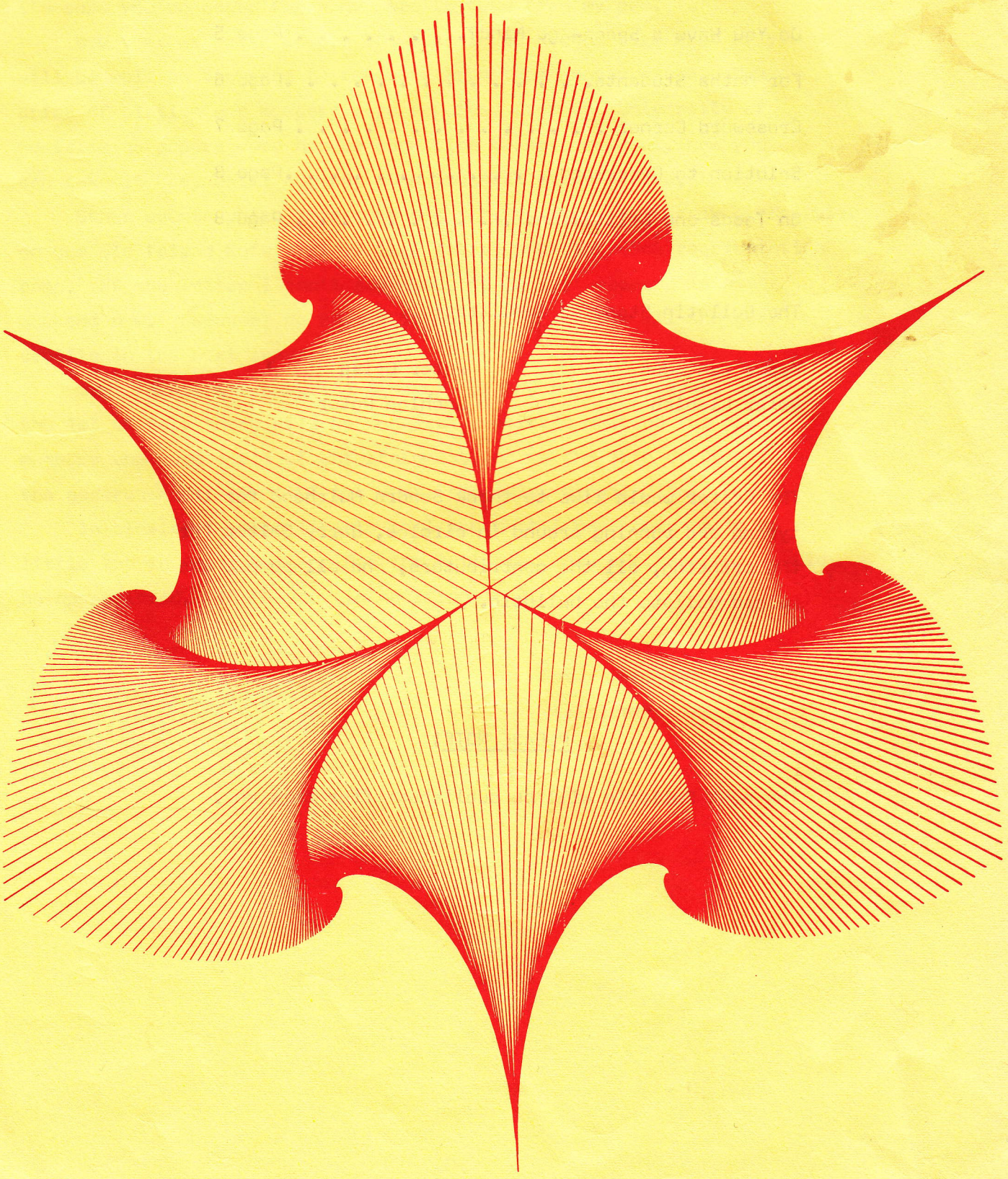
J- Gibson 50

SCIENCE BULLETIN



CONTENTS.

The Bulletin Standing Committee:

Peter Ashenden
Peter Crisp
Peter Liebich
Lachlan Peter

The Editor would like to thank Sandra Muirhead for the typing and running around in circles, Barry Salter for the printing, all the contributors, and all people who helped collate the bulletin.

PLEASE NOTE!

The next Bulletin will be published after this one.

EDITORIAL.

At last! - The event you have all been waiting for has arrived: Publication of the second Bulletin of 1978. This is a special event for me, too, as this is the very first editorial I've ever written. I'm sure you're eager for many more to come from my pen.

Now that we are a couple of weeks in to second term most of you will be well on the road to recovery from those nasty exams. Mixed cries of elation and despair were reported from the University of Adelaide as papers were handed back with marks. However, now you can take it easy until August, when the next exams arrive.

Other events which this term has already seen are a talk by Mr.Tyler on our old friend Bufo marinus (see later) and the AUScA reorientation camp. Of the latter I can't say much, since last weekend is next weekend now. However, we should be able to bring you all the gory details in the next issue.

Don't forget the exciting line-up for the next few weeks! On the 1st of July there will be an AUScA committee meeting for all members who need a bit of entertainment and on the 28th of July is the gastronomical event of the year, the AUScA Annual Dinner.

In closing I would like to tell you that I have been up to my little toe in contributions for the Bulletin. However, any more would be appreciated. Thank you (in anticipation).

Peter Ashenden (QM)
Assistant Editor.

This hot tip for the Zoology II exam arrived anonymously in my mailbox, unfortunately too late for it to be of use to Zoology II students. - Editor.

THE UNIVERSITY OF ADELAIDE

EXAMINATIONS FOR THE ORDINARY DEGREE OF B.A. AND B.Sc.

MAY 1978

ZOOLOGY II (SZ02)

FIRST TERM PAPER

Time: 3 hours

(In addition, candidates are allowed ten minutes before the exam begins to read the paper; ten minutes to say their prayers; ten minutes coffee break every ten minutes.)

Candidates must attempt all questions.

SECTION A

1. EITHER Discuss the philosophy behind Einstein's Theory of Relativity and its relation to modern parapsychology, cybernetics and relationships between crustacea and trilobites
   OR Compare the effects of a foot or a large rock on any invertebrate.

2. Write an essay on the evolution of rock.

3. Write notes on all of the following;

   i) "Crustacea should be treated with respect, because of their diversity, carapace and appendages; they should not be eaten. It is sacrilege."

   ii) Potential use of Millipedes in the Antarctic (instead of dogs) for pulling sleds.

   iii) Relevance of poetry to modern zoology.

   iv) Diversity of boy scout jokes.

   v) The phylogenetic relationship between the exoskeleton and Red Skelton.

4. Describe the diversity of the Kingdom Animalia in 830,000 words or less.

SECTION B

5. Write 30 boy scout jokes: marks will be given for comments on crustacea, DAD's lectures, sex. Porn is acceptable.

6. Write an essay.

7. Compare the locomotion of Onychophora with that of iuliform Diplopods and the Overland.

8. Write an essay on Radiolarians and compare their performance to cross-plys.

A Decade and a Half of Rocket Research at the University of Adelaide

B.H.Horton, Department of Physics, University of Adelaide.
(First printed in The Australian Physicist, August 1977)

The presence of the Woomera Rocket Range in South Australia placed the infant Space Age on the doorstep of Adelaide University. While refusing full duties of parenthood, the University took some interest in the child.

Professor J. H. Carver's establishment project, following appointment in 1961 to the Elder Chair of Physics at the University related to the laboratory study of photo reactions in the ultraviolet region of the spectrum with gases of the atmosphere and a parallel development of rocket borne sensors to study 'in situ', the effects of solar radiation in the same wavelength band in the upper atmosphere. A cooperative programme was arrived at with Mr. R. W. Boswell, Controller, Weapons Research Establishment, whereby Professor Carver would have the assistance of the Flights Projects Group of the Weapons Research Establishment, headed by Mr. Bryan Rofe while financial assistance was also given in the form of a grant from the Department of Supply.

The first experiments planned for the rocket programme involved the use of ion chambers of the type developed by Friedman et al. (1958) for measurement of the intensity distribution with altitude of the solar Lyman α line of atomic hydrogen. Due to the component constituents of the atmosphere the penetration height of solar u.v. is as shown in Figure 1 where it may be seen that O_2 is the predominant absorber of the Lyman α line at 121.5 nm. By measurement of the absorption profile, the variation of number density of O_2 with height could be obtained.

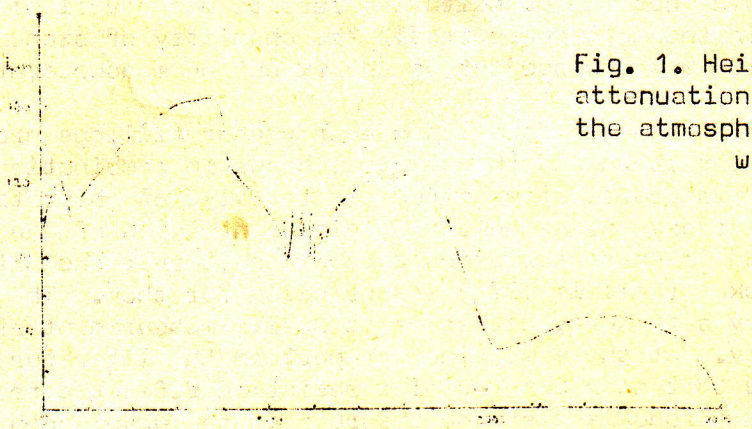


Fig. 1. Height of 1^{-1} attenuation of solar radiation by the atmosphere as a function of wavelength.

The rocket used in these first experiments was the H.A.D. vehicle, a two stage solid fuel rocket developed by Flight Projects Group for making measurements of high altitude (total) density and winds employing the falling sphere method (Malcolm, 1972).

The H.A.D. vehicle had a 5 inch diameter second stage with the payload at the forward end and could lift a 14kg all up payload to 100km. The vehicle performance was such that the instrumentation to be flown had to survive up to 3 seconds acceleration at some 50 - 70g while vibration resulted in accelerations up to 10g covering a frequency range of 0 to 2 KHz. Temperature variations, due to aerodynamic heating of the skin and conduction to the instrumentation, may range to 120°C during flight, increasing the design problems of the instrumentation. The rocket was also unstabilized and spin rates were not easily predictable. This, coupled with limitations on data transmission rates, made the design of a new type of solar aspect sensor necessary for observation of solat tadiation intensities, imperative.

It is perhaps surprising in these days of integrated circuits of microscopic dimensions, to consider the manufacture of amplifiers accepting inputs of up to 500mV with an input impedance 30 MΩ with stability of 0.7% of full scale over the range of conditions described above, based on valves and individual transistors and other components, but this work was successfully carried out by Dr. E. L. Murray, P. Stevenson and J. McFadyen who formed the electronics section of the group.

The design, testing and calibration of the ion chambers were carried out by Dr. P. Mitchell. A number of small problems had to be overcome and a range of ancilliary equipment produced. Recalling that the whole experiment had to go to the range, be finally checked there before flight and then flown fully self-contained, it is not hard to imagine the new procedures that had to be developed. The whole operation was based on materials available; for example, battery packs to supply power to the experiments during flight were those available in the supermarkets, not special items of the "new space age". Fuller descriptions of the items are recorded (Mitchell, 1966).

The culmination of this work came at 0930 cst December 6, 1963 when HAD 301 was fired from the Woomera range. The instrumentation carried was two Lyman α ion chambers, an altitude camera and sunslits for aspect sensing and associated electronics, modulators and telemetry transmitters. The rocket reached an altitude of 88km and all systems operated correctly. The first results of these measurements of O_2 densities, probably the first in the Southern Hemisphere, appeared in 1964 (Carver et al., 1964). HAD 302 suffered a structural failure and HAD 304 was successful, with the inclusion of the Adelaide designed solar aspect sensors, reaching an altitude of 91.1 km.

In 1965 the Australian Research Grants Committee provided funds for support of the rocket programme. These proved invaluable in extending the range of materials and components available for consideration in design and opened opportunities for increasing the technical support.

While the Lyman α HAD project was proceeding two parallel projects were under way. It was known that, above the mesopause, the photochemistry of the atmosphere became more complex with the level of dissociation of molecular oxygen increasing but few quantitative results were available for these altitudes, while in the mesosphere itself the chemistry of ozone in absence of solar radiation was the subject of theory but no measurements had been made.

Ion chambers with different windows and gas or vapour fillings provided spectrally sensitive detectors and the spectral bands in combination covered a range of some two orders of magnitude in the size of absorption cross section of molecular oxygen. A number of different types of ion chambers were made and their characteristics determined (Carver and Mitchell 1964) and a Long Tom rocket (Malcolm 1972) was prepared for them. The payload was also to carry soft X-ray detectors to enable measurement of total atmospheric density. At the same time a report in the literature (Heddle, 1962) suggested that near ultra-violet radiation reflected from the moon was detectable. Ozone is a strong absorber in the wavelength range 220 to 290nm and, while insufficient to be photochemically active, lunar radiation could be used by absorption measurement to give ozone densities at night. Photometers were designed to detect the low fluxes expected (10^{-11}-10^{-12} watts cm^{-2} nm^{-1}) employing interference filters and the 1P28 photomultiplier. This detector, while no way ruggedised for the harsh environment planned for it, was found to survive ground acceleration and vibration tests providing the high tension was not applied during the period of motor burn. Both these projects came to fruition (Carver et al.,1967),(Carver et al. 1969).

During this period some changes had occurred in the staff. Dr. Murray and J. McFadyen had left the group while S. Dowden, R. Hurn, A. Robertson and A. Suskin had joined. Professor K. McCracken had been appointed to the Department and had taken an interest in use of rockets for X-ray astronomy. While the Australian vehicles available were unsuited for the tasks envisaged space was made available on UKSRC Skylark vehicles. Working with investigators from the Department of Physics, University of Tasmania, X-ray proportional counters were integrated into an instrumentation package, which, with some modification, was flown on two UKSRC Skylark vehicles from Woomera. These flights contributed considerably to the knowledge of variations in the observed flux of X-ray stars (Francey et al., 1967). The development of rocket instrumentation for X-ray studies over this period is described by Francey et al.,(1969).

...

This article will be continued in the next issue.

DO YOU HAVE A SPACE-AGE MIND?

This quiz, by Grace and Larry Spruch, was presented in all seriousness by the Reader's Digest periodical.

The answers will be printed in the next bulletin.

1. The Theorem of Pythagoras states that (A) in any triangle the square of the longest side equals the sum of the squares of the other sides (B) in any triangle the square of the longest side equals the square of the sum of the other sides (C) in a right triangle the square of the hypotenuse equals the sum of the squares of the other sides (D) in an isosceles triangle the third side equals the sum of the two equal sides.
2. Thirteen thousand million years corresponds most closely to the presumed (A) age of the universe (B) age of earth (C) time since the dinosaurs were on earth (D) time man has been on earth.
3. A lunar eclipse can occur only when (A) the earth is between the sun and the moon (B) the moon is between the earth and the sun (C) the sun is between the moon and the earth (D) there is a new moon.
4. The conservation-of-energy principle refers to the fact that (A) it is essential not to waste natural gas and oil, for these are limited in supply (B) solar heating makes use of the sun's energy, which would otherwise be wasted (C) energy can be neither created nor destroyed (D) nuclear-power plants recycle spent fuel.
5. The splitting of an atomic nucleus into two large fragments and several smaller particles is known as (A) fusion (B) alpha decay (C) fission (D) thermonuclear energy.
6. Atoms are believed to be composed of (A) protons, neutrons and electrons (B) protons and electrons (C) positrons, neutrinos and electrons (D) protons and antiprotons.
7. The period of revolution of the moon about the earth is approximately (A) one hour (B) one day (C) one month (D) one year.
8. Identify the non-astronomical objects (A) white spots and red midgets (B) white dwarfs and black holes (C) quasars and supernovae (D) neutron stars and galaxies.
9. A planet that is never visible to the naked eye is (A) Mercury (B) Venus (C) Mars (D) Neptune.
10. The chain reaction that forms the basis of the atomic bomb was first achieved by a group directed by(A) Albert Einstein (B) Niels Bohr (C)Edward Teller (D) Enrico Fermi.
11. The gravitational force between two spherical objects is known to be inversely proportional to the square of the distance between their centres. If that distance is made three times as large, the gravitational force will be (A) three times as small (B) nine times as small (C) two times as small (D) three times as large.
12. Who did not make fundamental contributions to the science of electricity? (A) Charles Coulomb (B) Michael Faraday (C) Benjamin Franklin (D) Isaac Newton.
13. The Big Bang is related to (A) the hydrogen bomb (B) the maximum noise level in an amplifier (C) a theory of the origin of the universe (D) supersonic aircraft.
14. Nuclear physics does not deal with (A) alpha particles (B) beta rays (C) deuterons (D) deoxyribonucleic acid.
15. Radiocarbon dating is a technique by which (A) persons who might get along well together are identified by computer (B) the fading of carbon copies is used to discover the age of documents (C) the age of archaeological artefacts is measured (D) the length of time that a patient has had cancer is determined.
16. A laser is not (A) a source of light that can be focused to a tiny area (B) a device conceived by Jules Verne for propelling a man to the moon (C) employed in some delicate eye operations (D) a device that was used to measure the distance to the moon.
17. Light (A) can travel in a vacuum (B) can travel at infinite speed (C) always travels in lines that are perfectly straight (D) cannot travel through solid objects.

18. A rocket moves because (A) its shape permits air to support it (B) it has exceptionally powerful propellers (C) it weighs less than the air it displaces (D) it pushes against its own exhaust.
19. The speed of sound (in air at sea level) is most nearly (A) three metres per second (B) 300 metres per second (C) 3000 metres per second (D) 300,000 kilometres per second.
20. Newton's three laws relate to (A) electricity (B) atomic physics (C) heat (D) motion.
21. A hologram is (A) a rapid means of communication (B) a slide that can be used to produce three-dimensional images (C) an atom smasher (D) a future mode of transportation.
22. The "Red Planet" is (A) Saturn (B) Venus (C) Sputnik (D) Mars.
23. A half-life is (A) a molecule that cannot be classed as definitely organic or definitely inorganic (B) half the average life expectancy of a group of people (C) the time for half a given amount of radioactive material to decay (D) the radiation dose that will be lethal to half the subjects in an experiment.
24. Give the proper order of the names Archimedes, Copernicus, Einstein, and Galileo so that they correspond to these statements:
    - The first to view the moons of Jupiter through a telescope.
    - Showed the equivalence of mass and energy.
    - Stated that a floating body displaces a volume of water the weight of which equals the weight of the body.
    - Stated that the sun, not the earth, is at the centre of the solar system.

    (A) Archimedes, Einstein, Galileo, Copernicus
    (B) Copernicus, Einstein, Archimedes, Galileo
    (C) Copernicus, Archimedes, Galileo, Einstein
    (D) Galileo, Einstein, Archimedes, Copernicus.
25. A topic <u>not</u> likely to arise in SALT talks is (A) NaCl (B) ICBM (C) MIRV (D) B-1.

·_·

FOR MATHS I STUDENTS

Maths I students are studying functions of two variables in the Calculus course. Here is such a function discovered by Ralph Baer earlier this year, called <u>The Baer Tit Function</u> denoted by B(x,y),

$$B(x,y) = \max\left(0,\ \cos r + \min\left(0.25,\ \frac{1}{5\sqrt{2\pi}}\, e^{-\frac{r^2}{4}}\right)\right) + 0.05\, d \cos^{20} r$$

where $r = \sqrt{x^2 + y^2}$

$d = \begin{cases} 1 & \text{if } -15 < r < 15 \\ 0 & \text{otherwise.} \end{cases}$

The most interesting point about this function is the absolute maximum on the domain.

A graph of z= B(x,y) will be posted in room S6, on the Maths Department notice board (perhaps), and is available from any disreputable newsagent.

·_·

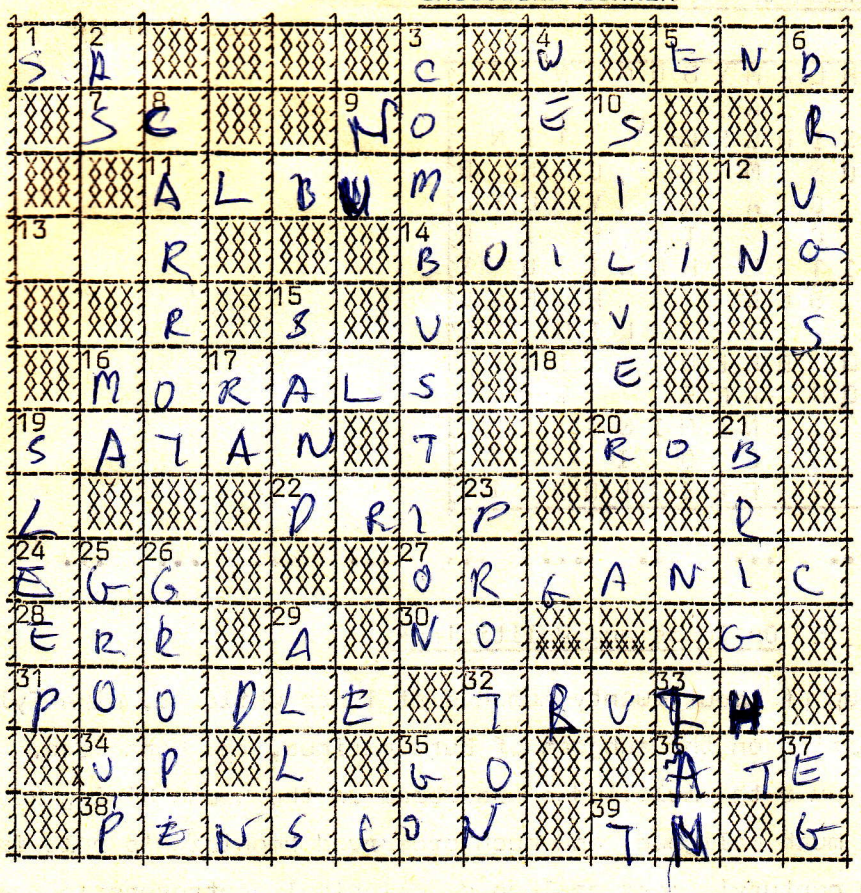
QUAINT QUOTES.

Sign outside a Calcutta hairdressing salon;

"Going grey and looking old? Come to us for dying."
-Sonali Bose

A perfectionist is a person who cannot find a solution to any problem, but can find a problem in every solution.

CROSSWORD CORNER



CLUES

Across

1. South Australia
5. Termination
7. Contact letters - P&I Chem.
9. Holy _____!
11. Photo _____
12. Gold
13. Preposition/conjunction
14. _____ point of water=100°C
16. Cynthia is the _____ officer
18. Id est
19. The devil (not referring to a member of AUScA.)
*20. President Trengove
*22. Collection of H_2O molecules (or an undesirable character)
24. Beginning of a human
27. Type of chemistry
28. to wander
30. negative answer
31. a type of dog
32. _____ is stranger than (science) fiction
34. opposite to down
35. to leave
36. Consumed
38. What scientists (and others) receive when they've retired
39. Tin

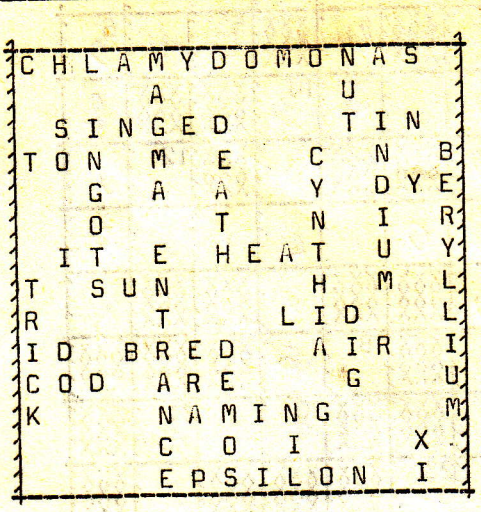
Down

2. Poisonous element
3. process of burning
4. us
5. Narcotics
8. Root vegetable
9. Greek letter
10. Ag
12. Indefinite article
15. SiO_2
16. Mother (F=__)
17. Sun god
18. What students lack
21. Intelligent (Huh?)
23. Positively charged nucleon
25. & 26. Norm Greet's activity at the O-camp (See page 5 of previous edition)
29. ____ well that ends well
33. Girls do it on the beach
35. Green light
37. exempli gratia

(* Is the jusclaposition of these two clues significant? - Editor)

See next page for solutions of the crossword in the last edition of the bulletin.

Solution to crossword in last edition.



... ...

On Toads and Politicians.

An intrepid group of about twenty munched at lunch while Mr. Mike Tyler gave a short dissertation on the subject of Bufo marinus, the Cane Toad. Rolls of mirth burst over the multitudes assembled in the South Dining Room, as the story of this much maligned, and much preserved amphibian's role in one of the twentieth century's most prolonged ecological controversies was related.

Mr. Tyler's role in this saga was received with raucous laughter from the back stalls, as we heard of borrowed fire engines at Perth Airport; and the thrill of speaking, to the chorus of croaking toads lost in air cargo terminal, on 140 radio stations across Canada.

The role of Queensland Premiers past in the tale of the Toad did nothing to dispel rumours about the origin and nature of the present incumbent of that post, while the common sense of certain wildlife Directors was questioned somewhat.

Over all the talk was well received, and the people present expressed their thanks to Mr. Tyler with a solid round of applause. The Association is grateful to Mr. Tyler for consenting to give our first organized talk for the year, and it is hoped that many more of a similar nature will follow.

Paul Moritz.

Quaint Quotes

Secretary: "And when I asked him if he wanted the carbon double spaced too, he really blew his top!" - Tom Ewell

"The man who can smile when things go wrong has probably just thought of someone he can blame it on." - E. Freeman