

# THE HYDROLOGICAL SOCIETY OF S.A. INC.

C/o Water Resources Branch  
Box 1751, Adelaide, S.A. 5001

NEWSLETTER NO. 57

SEPTEMBER 1988

## STOP PRESS!

The HYDSOC meeting scheduled for 22nd September 1988 on "Irrigation and Rehabilitation" has been postponed to a date to be fixed in the 1989 programme.

## GUEST EDITORIAL:

### "AUSTRALIAN RAINFALL AND RUNOFF - 1987"

In September 1988, to write an editorial about a publication that was launched in December 1987 may seem to be somewhat irrelevant, however it is just possible that the significance of the publication of the Third Edition of "Australian Rainfall and Runoff" may not be appreciated by all associated with hydrology in Australia.

The story of the Third Edition of "Australian Rainfall and Runoff" really began more than thirty years ago with the production and publication of the first edition. In 1977 the second edition was released and in 1982 work was commenced on the third edition. In reality the Third Edition is far more than a revision of the second - it is in fact a new work and for the first time appears in two volumes, one dealing with rainfall, the other dealing with the engineering aspects of the hydrologic cycle.

Preparation of the Third Edition was undertaken by teams working within the University of New South Wales led by Associate Professor David Pilgrim, and the Bureau of Meteorology led by Dr. Ray Canterford. Both teams were assisted by engineers and hydrologists from all around the country - data were supplied, analytic techniques were developed, tested and refined, text was read, corrected, reread, amended and read again. It is impossible to accurately

estimate the number of individuals who made some contribution to the volumes, suffice it to say the numbers ran into many hundreds which represents a significant mobilisation of support.

Technically, the publication is at the very least equal to any other similar work in the world, and in a number of areas must be considered the leader. For example, it is wider in its scope than the British "Flood Studies Report", and it advocates techniques which represent a better application of fundamental engineering knowledge.

The publication of the Third Edition of "Australian Rainfall and Runoff" has made a number of 'in house' drainage manuals produced by road authorities and the like redundant, and there is now considerable scope for economic benefit as consistent and rational design procedures based on good data are taken up by the profession.

In producing the document, the Institution of Engineers has set the pace in the rainfall runoff field and has provided both engineers and hydrologists with the best possible data and techniques to handle both low and high flow problems for the benefit of the whole community.

KIM READ

## FROM THE ANNUAL GENERAL MEETING

CHAIRMAN'S REPORT 1988

In 1987-88 the Society continued to pursue its stated aim of promoting an interest in the science of hydrology and concern for water resources and their management conservation and use.

It did this by conducting meetings, issuing newsletters, offering support to other scientific groups and by commenting on government reports.

Seven meetings were held during the year. The topics covered were:

- 1) The Barossa Valley from a hydrologic viewpoint.
- 2) The Limnology of Mount Bold reservoir.
- 3) The hydromet data base system.
- 4) Murray-Darling Basin resource management.
- 5) The hydrology of the Northern Flinders Ranges.
- 6) A debate on the topic "Groundwater - to mine or not to mine".

And tonight's meeting.

Attendances at all meetings were good. The diversity of topics covered demonstrates the broad range of interests contained with the Society.

Three issues of the newsletter were produced this year. John Argue is to be commended for the fine job that he is doing as editor.

In the interests of supporting scientific research in hydrology, the committee gave financial support to the Scientific Expedition Group for the purpose of establishing a rain gauge in the remote Gammon Ranges. It is hoped that the results from this project will be the subject of a report at a future meeting of the Society.

The committee prepared a response to the River Murray Management Review. Chris Purton is to be thanked for his role in drafting the response.

A special achievement this year was the development of a computerised data base for our membership records. This has greatly streamlined the posting of newsletters and notices of meetings, as well as helping the treasurer keep an accurate record of the financial status of all members. A special vote of thanks goes to Anwen Aukland for setting up the data base.

The committee called for nominations for Honorary Life membership. It received 4 nominations and decided to award the title to one of the nominees.

As usual the Society contributed to the presentation made in connection with the Munro Oration and it was pleasing to see Prof. John Burton of University of New England nominated as the Munro Orator for 1988. John gave an entertaining oration at the Hydrology Symposium in Canberra in February of this year.

Applications were received for the Ian Laing Prize which will be presented this evening.

In concluding my report I would like to thank all members of the committee for the tremendous effort which they have made in organising meetings, food, drinks and providing ideas and support.

In particular I would like to thank Claus Schoenfeldt as Vice Chairman, Chris Wright as Secretary and Jerome Maguire as Treasurer, for the way in which they have contributed to making the Society run effectively for another year.

G. DANDY  
CHAIRMAN

PROFESSOR J. W. HOLMES  
(By Graham Allison)

John Holmes was a founding member of the Society and played a key role in its formation in 1969. Ever since that time he has been active in the life of the Society. He very ably handled the often onerous task of Editor of the Newsletter from 1978 to 1984. He continues to be a regular attendee at our meetings.

In his professional career John has played an important role in the local, national and international scene. In his early scientific career in CSIRO he developed the neutron moisture meter to a stage where it could be used to determine the water balance for a range of vegetation types. This led to his important work on quantifying groundwater recharge both in the south-east of S.A. and in W.A. The neutron moisture meter has now become a widely accepted tool in hydrological studies.

In the mid 1960s John saw the potential for using natural tritium to obtain information about groundwater systems, and under his guidance a facility to measure this isotope was developed.

In the late 1960s he became a foundation Professor of Earth Science at Flinders University while still retaining his links with CSIRO. He took up full time employment at Flinders in the early 1970s.

From that time until his retirement in 1985 he built up what became one of Australia's best known sources of well-trained graduates in hydrology. In fact this school became an important source of members for our Society.

At this time, while still retaining his collaborative links with CSIRO, he developed new research directions and was involved in an important set of studies concerned with the different hydrological roles played by a range of vegetation types. Under his guidance his postgraduate students tackled a wide range of hydrological problems, primarily in South Australia.

To cap his outstanding career, with Dr. T. J. Marshall, he wrote the textbook entitled 'Soil Physics' which has become widely used and has just run to its second edition.

In summary, Professor J. W. Holmes has had a major influence on the path of hydrology in Australia and in particular the Hydrological Society of S.A. We could have no worthier an Honorary Life Member.

#### IAN LAING PRIZE

Members will recall the instigation of the Hydrological Society prize under the chairmanship of Ian Laing.

Ian felt very strongly that the Society should be encouraging young scientists and engineers to pursue studies in the science of hydrology - interpreted in the broadest possible way.

After his untimely death, the Society honoured Ian by naming the prize after him.

The prize has been awarded on three previous occasions - twice to civil engineering students and once to a zoology student, and all students have subsequently brought credit on themselves in their chosen career.

The prize is awarded on the basis of 3 criteria:

- (1) a student's overall academic record;
- (2) performance in subjects specifically related to the fields of study embraced by the prize, and
- (3) a demonstrated interest in the designated fields of study.

This year the winner is ALISON TURNBULL, an Honours Student in Botany at University of Adelaide.

Alison completed a B.Sc., majoring in Botany at the University of Tasmania. In the 23 subjects which comprise the course, she obtained 8 high distinctions, 13 distinctions, and 2 credits. She was mentioned on the Dean's honour roll in all 3 years of the course.

This year Alison is studying for an honours degree in the Botany Department of the University of Adelaide. Her field of interest is light attenuation in the highly turbid and coloured water bodies of South Australia, and its effects on algal populations. Dr. George Ganf is supervising Alison's honours project.

#### A HYDROLOGICAL CROSSWORD PUZZLE

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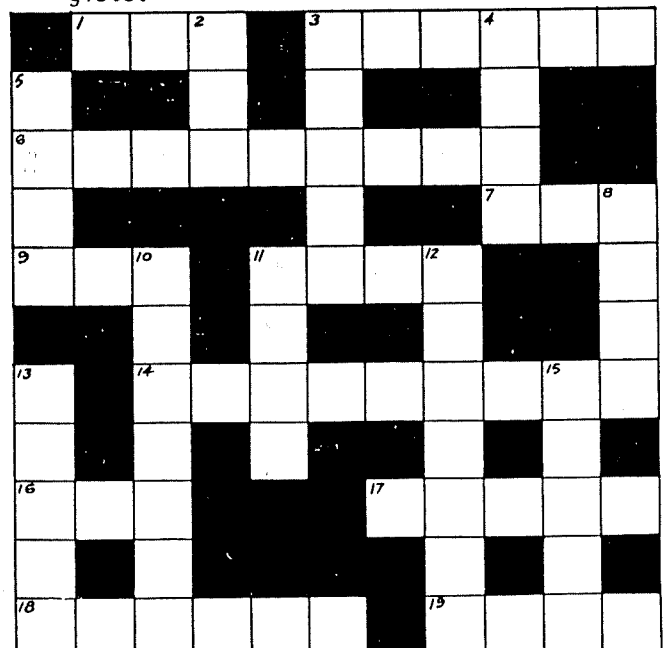
?

#### ACROSS

1. Start of the Hydrologic Cycle
3. Source or Drain ?
6. Important river in Ohio (U.S.A.)
7. Time span
9. Aid used by Hydrologists in their quest to solve difficult problems
11. Hydrological 'dirty word' in Sydney
14. Hydrological 'dirty word' in Melbourne
16. Where it all runs
17. South Asian country whose catchments have relatively short concentration times
18. Even as a child he was always auto-regressing
19. The product of geomorphological activity.

#### DOWN

2. Name of world's first hydrographic survey vessel
3. His melody lingers on
4. City built over the world's oldest operating stormwater drain
5. Goes well with Green
8. World's first hydrographic surveyor
10. Water-bearing stratum
11. It comes down
12. Around all catchments
13. Rain results
15. Marine delicacy enjoyed by most hydrologists.



(SOLUTION NEXT ISSUE!)

## FROM THE HYDROLOGICAL TRAPS.....

A.G.C. INVOLVEMENT IN GROUNDWATER PROJECTS

(Reporter : Steve Barnett)

In past months, Australian Groundwater Consultants Pty. Limited has been involved with a range of activities in South Australia.

The most significant projects include:

- An assessment of the potential for aquifers in northern St. Vincent Basin to supply sufficient water in the long term to cool a lignite-fired power station, which may eventually be constructed in the area.
- Further management review of the groundwater component of the Leigh Creek town water supply.
- Development of a supplementary salt water supply for the Olympic Dam project from fractured pre-Cambrian quartzites.
- Preliminary assessment and development of brine aquifers in western Victoria for salt production.
- Water supply developments in metropolitan Adelaide.
- Exploration for shallow groundwater near Whyalla. The water will be used for construction purposes at a new iron ore mine (Iron Duke).

GAWLER RIVER

(Reporter : Peter Saunders)

Lange, Dames & Campbell is carrying out flood plain mapping (100 year flood) for the Gawler River between the east boundary of the District Council of Mallala area and the Gawler By-Pass. The study is being done for the District Council of Light, Corporation of Gawler and the City of Munno Para, and is an extension of a previous study for the District Council of Mallala. The job is expected to be completed by the end of September.

LONG GULLY FLOOD, MANNUM

(Reporter : Bill Lipp)

On the evening of 19 April 1988, an intense thunderstorm occurred over the 55 sq.km catchment of Long Gully Creek, which enters the River Murray 2 km north of Mannum. It appears that intense rain fell over a period of approximately 90 minutes, with the area of highest rainfall (115 mm) coincident with the centre of the catchment. Average rainfall over the catchment was about 85 mm.

The road between Mannum and Purnong crosses the creek on a low causeway. By measurement of the flood marks on the causeway, the peak flow was estimated at 220 m<sup>3</sup>/sec. Although no information is available on the shape or volume of the hydrograph, this peak flow could be easily reproduced using the RORB model, with kc as derived by the E. & W.S. Department for the Adelaide Hills. This was with an initial loss of 20 mm and a continuing loss of 2 mm/hr. If these losses are valid, approximately 75% of the rainfall appeared as runoff.

The only waterway opening under the causeway (which was built in 1958) is a 1500 diameter pipe. There is no flooding history at this locality, and according to local residents the creek rarely flows. Evidence to support this type of behaviour is available in the gauging records of Preamimma Creek which drains 48.5 sq.km of similar country in the Monarto area.

In the 10 years of records at this station, the maximum recorded flow has been 0.32 m<sup>3</sup>/sec. It appears that the loss mechanism, of these catchments, is such that they only respond to extreme, short duration events.

Local evidence, that the present geomorphological form of Long Gully Creek largely dates from the last major flood in January 1941, supports this.

THE EFFECT OF LAND CLEARANCE IN THE MALLEE  
REGION ON RIVER MURRAY SALINITY  
AND LAND SALINISATION

(Reporter : Steve Barnett)

The effects of European settlement on the hydrogeological equilibrium of southern Australia have been well documented, especially in Victoria where the extensive clearing of native vegetation and large-scale irrigation have led to rising water tables and salinisation in the Mallee, Riverina Plain and Highland Regions. In South Australia, concern has been focussed on the salinity of the River Murray which is a vital resource to the State.

The clearing of native vegetation has had a dramatic effect on recharge rates in the Murray Basin with an increase of two orders of magnitude having been measured in the Mallee region by the CSIRO Division of Water Resources. The consequent rise in water table will have two main deleterious effects. The most immediate is land salinisation in low-lying areas to the south-west of the Mallee. The process has already begun in areas where the water table is within 40 m of the surface : in these cases an average rise of 0.1 metre/year is apparent. Where the water table is deeper, no rising trend is apparent.

In very low-lying areas (less than 5 metres above sea level) within this portion of the Mallee, the rising water table has already affected several hundred hectares in the last three years or so to the south-east of Murray Bridge and also to the west of Keith. If these trends continue, another 20,000 hectares will be salt-affected within 25 years. Fifty years from now, the whole of the area below 20 metres AHD will be at risk to salinisation, with consequent loss of land values of at least \$60 million. A conservative estimate of agricultural production loss is \$20 million annually.

The second consequence is increasing inflows of saline groundwater to the River Murray leading to an increase in river salinity. Although the water table adjacent to the river has yet to start rising, modelling of the process has indicated that an increase of 70 EC will occur at Morgan 50 years after it begins responding to the increased recharge. Modelling also suggests that broadscale revegetation in strategic areas may be able to reduce the saline groundwater inflows by reducing recharge. Further detailed modelling will be carried out to confirm these estimates.

SADME EXPERIMENTAL RECHARGE WELL  
LANGHORNE CREEK, SOUTH AUSTRALIA

(Reporter : S. R. Howles)

Over-extraction from the confined limestone aquifer underlying the Angas-Bremer irrigation area in South Australia has resulted in a major salinity problem.

Artificial recharge wells utilising low salinity flood waters have been used on a small scale by irrigators in the area for fifteen years with considerable success. The South Australian Department of Mines and Energy (SADME) has been involved in experimental work since 1982. Recharge wells create small reservoirs of low salinity water. This method is now seen as a management method of importance for individual irrigators in the area.

The SADME has constructed an artificial recharge well as an example of construction, operation, maintenance and effectiveness. It is anticipated that valuable information concerning blockage of recharge wells, local salinity effects and chemical interaction of recharge water with the aquifer matrix will be gathered.

Consideration of the hydraulics led to the recommendation that the recharge well be drilled with a diameter of 250 mm penetrating 85% of the confined aquifer thickness. The final depth was 70 m with the lower 35 m completed open hole. River water less than 1000 mg/L will be gravity recharged via a 1.5 m x 2.5 m x 4.5 m deep concrete silt trap and screens. Pump testing indicates a safe yield of 18 L/s and a steady state recharge rate of 11 L/s. Aquifer parameters are calculated as transmissivity 200 sq.m/day, and storage coefficient 0.0002.

HUTT RIVER, CLARE

(Reporter : Peter Saunders)

Lange, Dames & Campbell Australia Pty. Ltd. has been engaged by the District Council of Clare to undertake a flood study for the Hutt River and its tributary creeks within the township of Clare. Clare has a long history of flooding, the first documented major flood occurring in 1852. The township's central business district is constructed adjacent to the Hutt River on the flood plain, and potential for considerable damage exists. During the largest recent flood in 1974, up to 1 metre of water flowed through business premises at the northern end of the town.

The firm is undertaking hydrological analysis and flood plain mapping for the 20, 50 and 100 year floods for the Hutt River, and the 20 and 100 year floods for the tributary creeks which flow through residential areas. Using the flood plain maps, damages will be estimated and then mitigation solutions examined. The study is scheduled for completion in September.

## THE SOUTH AUSTRALIAN WATER CENTRES

CENTRE FOR RESEARCH IN GROUNDWATER PROCESSES

The Centre for Research in Groundwater Processes was formed to meet the pressing needs for research and professional education on the physical, chemical and biological processes which affect groundwater quality and quantity. The Centre links expertise and provides a doorway to two CSIRO Divisions (Soils and Water Resources), Flinders University School of Earth Sciences, the Engineering and Water Supply Department and S.A. Department of Mines and Energy.

Centre staff have skills in hydrogeology, isotope and classical hydrogeochemistry, geostatistics, microbiology, soil physics, meteorology, and numerical modelling. Some current research projects in S.A. include assessment of: groundwater recharge and discharge in the western Murray-Darling basin, land and river salinity; water balances for Lake Alexandrina, the Cooper Creek-Coongie Lakes system and Willunga Basin; evapo-transpiration on Eyre Peninsula; estimation of diffuse discharge from the Great Artesian Basin; groundwater contamination by cheese factory and abattoir effluent near Mount Gambier; transport of nutrients and clays from hillslopes in the Mount Lofty Ranges; El Nino and its implications for droughts; palaeohistory of the Murray Mouth; and flow rates and hydrogeochemistry of aquifers in the Dilwyn Formation in the southeast of S.A.

Most projects involve development of new techniques to provide answers to current problems for water resource managers.

Currently, four Ph.D. and two Masters students are working on Centre projects and more students are wanted. Professional education needs are served by a series of workshops and short courses, the first of which are Applied Groundwater Flow Modelling (Aug. 29 - Sept. 2), Groundwater Hydrochemistry (Feb. 13-16, 1989), and Geostatistics in Water Resources (Nov. 13-17, 1989).

To discuss potential research problems and how to use the Centre for guidelines on postgraduate studies, or workshop enrolment forms, contact:

Dr. Peter Dillon,  
Centre for Research in Groundwater Processes,  
Private Mail Bag 2,  
GLEN OSMOND. S.A. 5064.

Telephone (08) 274.9381  
Fax (08) 338.1636

THE AUSTRALIAN CENTRE FOR WATER TREATMENT AND WATER QUALITY RESEARCH

The Australian Centre for Water Treatment and Water Quality Research is one of twelve Centres of Concentration in Water Research established by the Federal Government in mid-1987.

The Centre is a joint initiative of the E.&W.S. State Water Laboratory, the S.A. Institute of Technology's School of Chemical Technology, and the Waite Agricultural Research Institute's Department of Soil Science.

Its purpose is to provide research facilities and scientific services to the water industry and water users throughout Australia. The services may be sub-divided as problem solving, analytical, advisory, and educational. The Centre conducts research and undertakes consultancy on a commercial basis.

Present chemical research is focussed on the nature of organic and inorganic materials in water, their origin in vegetation and soils, and their behaviour in water treatment processes. Special emphasis is being given to the development of appropriate processes and strategies for Australian conditions, both in relation to public water supplies and industrial water use.

A major thrust of current biological research is in the investigation of protozoa in water, their interaction with algae, their role in decomposition processes (including wastewater treatment processes), and the control of particular groups of protozoa threatening to public health.

Projects are being undertaken for the Urban Water Research Association (AUWRA) and Country Towns Water Supply Improvement Programme (COWSIP). A stormwater quantity and quality monitoring project is being established and recent project negotiations with the Australian Mineral Industries Research Association (AMIRA) appear promising.

In response to the latest call for submissions to AWRAC, the Centre put forward fourteen grant applications.

Further information may be obtained from:

The Director,  
Australian Centre for Water Treatment  
and Water Quality Research,  
Private Mail Bag,  
SALISBURY. S.A. 5108.

Telephone (08) 259.0240  
Fax (08) 259.0228

SHORT COURSE ON GROUNDWATER HYDROCHEMISTRY

## INTRODUCTION

A course on Groundwater Hydrochemistry : Principles, Applications and Practice, will be held in Adelaide from 13-16 February 1989. The course is directed toward those individuals who seek to develop the necessary methods for utilising hydrochemical and isotope data in groundwater research, resource management and water quality investigations.

The four-day course will cover fundamentals of the geochemistry of natural waters and then lead to more complex problems involving geochemical modelling using the USGS programs WATEQ and PHREEQE. About half of the time will be involved in formal lectures while the remainder will be devoted to hands-on analytical procedures for field sampling and problem solving of case-histories. Some aspects of isotope hydrology will be presented at the end of the course.

## WORKSHOP LEADERS

Dr. Gordon Stanger is Lecturer in Hydrology at Flinders University of S.A. He has some 15 years experience in arid-zone research in the Middle East - Gulf area in various capacities including : commercial consultancy, Government water resource investigations and both Government and private sector hydrochemical research. He currently teaches both hydrology and hydrogeology, with a wide range of groundwater related interests including saline intrusion problems, chemical mass-balance models and the chemistry of water-rock interaction.

Dr. Andrew Herczeg is a Hydrochemist at the CSIRO Division of Water Resources. He has a Ph.D. in Geological Sciences from Columbia University, New York, and spent three years as a Postdoctoral fellow at the Australian National University. He has published several journal articles in hydrochemistry and isotope geochemistry of natural waters. Major research interests include geochemical processes in regional groundwater systems and arid-zone isotope hydrology.

## LOCATION

All sessions will be held at the School of Earth Sciences, Flinders University of South Australia.

## COST

The cost for the four day course is \$450.00. This includes written materials for the course, light refreshments and lunches. An all-inclusive course dinner will be arranged at a nearby restaurant for about \$30.00.

## PRE-REQUISITES

None. Some chemistry training may be helpful. Experience with editing Fortran 77 on IBM-type PC's would be an asset, but not essential, for running personalised geochemical programs such as WATEQ and PHREEQE.

## REGISTRATION AND INFORMATION

Please register your intention to attend the workshop as soon as possible, but no later than December 16, 1988.

For further enquiries contact Dr. Peter Dillon, at Centre for Research in Groundwater Processes.

Telephone (08) 274.9311 or 274.9381.

SCIENTIFIC EXPEDITION GROUP

## PUBLIC MEETING - ALL WELCOME

The Annual General Meeting of the Scientific Expedition Group will be held on

FRIDAY 14th OCTOBER, 1988

at

T.P.I. Building, Corner Hutt Street & South Terrace, Adelaide.

The meeting will commence at 7.30 p.m. with a short business meeting to be followed by two talks:

- "Gammon Ranges Project", by John Waterhouse.
- "Some Impressions of Herd Island in the Summer of 1987/88", by Jill Tideman.

The meeting will conclude with supper.

ALL WELCOME

## FROM THE SECRETARY.....

The Annual General Meeting was held on 25 August 1988. Approximately 28 members attended. The occasion was marked by an award of Honorary Life Membership which was conferred on Professor John Holmes by the Chairman, Dr. Graeme Dandy. The Chairman, in his award speech, praised the work done by Professor Holmes for the Society and for hydrology. A copy of the speech appears above. Professor Holmes is only the second member of the society to be given Honorary Life Membership, the other being Mr. Skip Tonkin. We wish to congratulate him.

The second award made during the meeting was the Ian Laing Prize, which is awarded to first-degree students for academic achievement in fields related to hydrology. This year the prize was won by Ms. Alison Turnbull, Honours student in Botany at the University of Adelaide. The work which she is doing in microbiological studies is of interest to Hydrologists in South Australia and it is hoped that she will have an opportunity to present a paper at one of the Society meetings.

Nominations had been called for positions on the committee for 1988/89. The Secretary announced that the positions that fell vacant had been filled by the required number of nominations, and under the terms of the Constitution, he reported that the new Committee consisted of:

· Claus Schonfeldt	Chairman	Phone : 226.2500
· Zac Sibenaler	Treasurer	274.7573
· Chris. Wright	Secretary	366.2222
· Peter Smith	Vice-Chairman	274.7691
· Anwen Aukland	Records Secretary	274.7570
· John Argue	Newsletter Editor	343.3131
· Chris. Purton		223.5583
· Steve West		226.2485
· Dr. Graeme Dandy		228.5472
· Bill Lipp		343.2264
· Fred Leaney		274.9396

Following announcement of the Committee, the new Chairman, Claus Schonfeldt, took the Chair.

Mr. Vince Kotwicki then addressed the meeting on the subject of Water in the Solar System. This was a most interesting review of the solar system as it has been revealed by new technological advances, and information received from satellites and space-craft. Many excellent slides were shown of various amazing and unappetising parts of our planets and moons. Vince was able to convince his audience that without doubt, if we have to live in the solar system at all, then we should certainly live on this earth, preferably in South Australia. Anyone who attended his last address to the society on the flooding in Lake Eyre may remember being baffled at the outset by the conceptual problem of understanding his unit of volume, the CUBIC KILOMETRE!! However this was not good enough for Vince's requirements for the solar system, so he introduced a newer and larger unit, the CUBIC LIGHT-YEAR!! and then informed us that the universe was expanding at some enormous multiple of cubic light-years per second! If anyone is interested, Vince advises me that there are 10 to the power 39 cubic kilometres in a cubic light-year! Many thanks to him for a most entertaining evening.

As noted at the front of this newsletter, members will be aware that the proposed meeting on the Rehabilitation of Government Irrigation Schemes, scheduled for 22 September, was cancelled. The meeting was to have been held in conjunction with the Irrigation Association. We understand that moves to undertake rehabilitation of the various Riverland schemes, Cobdogla, Moorook and Cadell, among others, are still in a preliminary state. Hopefully a meeting can be arranged for next year's program.

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