



# AEES Newsletter

## The Society - David Rossiter (Treasurer)

Membership seems to have peaked due to members not paying their annual fees. If you have not yet renewed your subscription for this year, please send your subscription to AEES (Hon Sec, ASC GPO Box 378, Canberra ACT 2601) or renew through the IEAust's annual subscription system by marking AEES your preferred Society. The AEES subscription year is from 1 Dec to 30 November.

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## Litigation - Newcastle Workers Club from the President Charles Bubb

Suddenly Australian earthquakes are in the news again. The Cessnock NSW earthquake of 6 August 1994 was a strong earthquake by Australian standards at magnitude ML 5.3 but caused no injuries and little serious damage in the epicentral region. (See report below). 7000 claims to date amount to \$30M or \$4300 per claim. The Newcastle earthquake generated 70 000 claims for a cost of \$960 000 or an average of \$14 000 per claim. The cost per claim is 3.2 times greater and total claims 32 times greater. That is Cessnock 1994 was much more like the Newcastle 1925 event than the very damaging Newcastle 1989 earthquake. Why is it so? One similarity was that there were no aftershocks of any engineering significance.

We will have discussion on these points at our Canberra Conference in November.

As I write, a mini swarm of earthquakes continues at Eugowra NSW - hundreds of small events have been felt or recorded. These appear to be of little engineering significance, but of course are of considerable

interest to seismologists who have saturated the area with seismographs.

I must also refer to newspaper articles for the next item which is shaking the legal ground rules rather than the ground we stand on. The possible consequences of the legal actions described in the SMH of 2/8/94 (see below) and the Newcastle press may have as great an effect on the building professions as the earthquake itself.

All the publishable details are given in the newspaper articles (page 4) including the following summary:- "So far, the case involves 13 plaintiffs, two defendants and six cross-defendants and will run well into next year." SMH 2/8/94 Page 9.

The 13 plaintiffs (13 people injured in the earthquake) are suing the Newcastle Workers Club and the Newcastle City Council for personal damages. The Club and the Council are suing each other and now the architect, the building company and the engineer.

A number of members of the AEES have been contacted by the various parties involved to provide them with their expert opinion in relation to the case. These members may be called as expert witnesses in due course. The case will begin at the Newcastle Supreme Court in November. There are fundamental matters to be resolved and all of the building professions throughout Australia will be monitoring the proceedings and the Court decisions closely.

The second newspaper report refers to an emergency which was not an earthquake but a near catastrophic loss of power in WA during a severe storm on 23 May 1994.

The Financial Review of 25/7/94 says:- "Australia's telephone system is unlikely to cope with a major natural or civil disaster a report issued in Western Australia yesterday indicated." The report said that only 1 in 60 telephone calls made to the SEC was answered and SECWA did not have a contingency plan to handle the storm.

This is another topic we would hope to have discussed in our Lifelines Conference in Canberra. I hope to see you there in November 1994.



**AEES'93 Conference Proceedings**  
Attractively bound copies are available at \$30.00 (plus post and packaging). For \$45 you can buy both '92 and '93 Proceedings from the Hon Secretary (GPO Box 378, Canberra ACT 2601)

Photo: Retrofit - New Zealand style in Wellington

#### **AEES SEMINAR and AGM'94**

The focus for this year's seminar in Canberra is *Lifelines* but we will consider papers on related topics. The date: November 14/15 and venue the IEAust headquarters building, Barton, Canberra. Sessions on Monday afternoon and Tuesday morning; dinner Monday night. The AGM will follow the Monday afternoon session and precede the pre-dinner drinks.

Visit the Australian Seismological Centre and/or Science & Technology Centre (earthquake display) on Tuesday afternoon.

**AGM.** Election time again, nominations should be received by the Hon Secretary in writing at least 1 week before the AGM which will be on 14 November. Any agenda items should also be sent well ahead.

#### **Cessnock NSW earthquake 6-8-1994** by Australian Seismological Centre staff

At 9:04 pm on Saturday 6 August 1994 a strong earthquake shook the Hunter region of New South Wales. The epicentre was located within a few kilometres of Ellalong Village,

13 km southwest of Cessnock and about 45 km west of Newcastle. There were no injuries and little major structural damage in the epicentral region. The pub at Ellalong suffered severe structural damage and several houses near the epicentre were badly damaged. Insurance claims have topped \$30 million although the average claim was only a few thousand dollars. In Newcastle there was some non-structural damage.

The earthquake was felt by some Sydney residents 100 km to the south and in Canberra by a few people in high rise apartments at an epicentral distance of 330 km.

The magnitude was ML 5.3, slightly smaller than the ML 5.6 earthquake of 27 December 1989 that wrought so much damage on Newcastle. The August earthquake was felt over a much smaller area than that of 1989 and our interpretation of distant seismograms indicates that the mainshock focal depth was less than 5 km compared with a depth of 11 ( $\pm 2$ ) km for the 1989 earthquake.

The ASC's Trevor Jones arrived at Ellalong at about 3 pm on Sunday evening to team up with Vaughan Wesson, Cameron Bricker, Adam Pascale, and Wayne Peck from the Seismology Research Centre at RMIT. Thirteen field instruments, 10 seismographs and 3 accelerographs, were deployed around the epicentre within 48 hours of the mainshock and about a dozen small 'aftershocks' up to magnitude 1.0 were recorded in the week of monitoring. The aftershocks were located at a depth of about 1.5 km.

The mainshock was located quickly and accurately with recordings from the network of seismographs installed by AGSO in the Hunter region after the 1989 earthquake. The accelerographs installed in Newcastle, Sydney and Canberra under the joint State and Federal Governments' urban monitoring program and a number of other accelerographs installed for monitoring (Sydney) Water Board dams and the experimental nuclear reactor at Lucas Heights were triggered by the earthquake.

This is undoubtedly the best strong motion dataset ever recorded in Australia and one of the best recorded anywhere in the world in an intraplate environment. It will be most useful for the next upgrade of the Australian Building Code and will be invaluable for modelling the response of Australian buildings to Australian earthquakes.



Most but not all of the accelerographs were installed on rock and the scaled peak horizontal acceleration is plotted as a function of distance in the figure (page 4) which shows a great scatter in peak values and a rapid attenuation of ground shaking with distance. Ground accelerations probably exceeded 0.1g out to 20 km or so from the epicentre.

Further analysis of the data is underway and results will be presented at the Australian Earthquake Engineering Society Conference in Canberra, November 14-15, 1994.

**Figure 1** (page 4) Attenuation of peak ground acceleration with distance as recorded on bedrock accelerographs in Newcastle, Sydney and Canberra. The acceleration is measured as a fraction of g, the gravitational acceleration ( $g = 9.8 \text{ m/s}^2$ ).

#### Peak Ground Acceleration

Records keep tumbling as new accelerograms are obtained in Australia. The maximum value of 0.53g at Tennant Creek has been usurped by the magic figure of 1g (vertical) at 50 Hz which was recorded recently at the epicentre of a magnitude ML 4.1 earthquake near Eugowra NSW. This event was one of a worrying (to the residents of Eugowra) 6 week swarm of earthquakes that was still continuing at the time this newsletter was being printed.

#### Recent major or damaging earthquakes worldwide

(reports from USGS, via e-mail)

##### May

There were no major earthquakes in May, nor loss of life.

##### June

(2nd) At least 250 people killed, 27 missing, 423 injured and 1426 houses damaged or destroyed by tsunami along the southeast coast of Java. Minor tsunami damage on the NW coast of Australia. (6th) Colombia. At least 295 people killed; 500 missing; 13 000 homeless and severe damage to houses highways and bridges by the earthquake and ensuing landslides in Cauca and Huila Departments'. (9th) The year's largest earthquake was in Bolivia and surprised many in the seismological community because of its size and great depth, and the enormous distance to which it was felt. '5 people killed in Peru; 3 killed in Arequipa Province. Numerous injuries and landslides occurred in

southern Peru. Some minor structural damage at Brasilia; Campo Grande; Porto Velho and Manaus Brazil; Arica Chile and Tacna Peru. Felt in many parts of South America, including most of Argentina Bolivia and Brazil; felt lightly in Uruguay. Felt in the Dominican Republic; Puerto Rico; at many locations in North America including Los Angeles; Renton; Omaha; Sioux City; Minneapolis; La Crosse; Chicago; Parkersburg; Norwich; Boston; and Toronto Canada.

This is the first earthquake from this part of South America believed to have been felt in North America and is at M 8.2 also believed to be the largest ever recorded in this area.

(18th) The New Zealand earthquake caused some structural damage at Christchurch. Landslides blocked Highway 73. Felt throughout South Island and the southern part of North Island'.

##### July

The Banda Sea events on 16 June and 13 July were felt in Darwin with intensity IV on the modified Mercalli scale.

Table Epicentre details

Date	Time UTC	Lat	Long	Dep km	Mw	Place
May						
June						
02	1817	10.5S	113.0E	33	7.7	S Java Indonesia
06	2047	2.9N	76.1W	9	6.8	Colombia
09	0033	13.8S	67.6W	637	8.2	Bolivia
16	1012	7.4S	128.1E	119	6.0	Banda Sea
18	0325	42.9S	171.5E	33	6.8	South Is NZ
July						
13	1145	7.5S	127.9E	184	6.3	Banda Sea

#### Australian engineering seismologists visit China

Kevin McCue (AGSO) and Gary Gibson (SRC) visited China from 23 June to 4 July to pursue projects of mutual interest being undertaken under a 1990 agreement between the SSB China and AGSO Australia. Two Australian Kelunji recorders designed and built at the SRC were coupled to Chinese WLJ accelerometers and installed in 1992 near Tangshan.

Some 250 km east of Beijing, Tangshan is a major industrial city of 1 million people which in 1976 was devastated by a magnitude Ms 7.8 earthquake. At least one quarter of Tangshan's residents died in the earthquake.



# Telephone system could not cope in emergency: report

By NIGEL WILSON

AUSTRALIA'S telephone system is unlikely to cope with a major natural or civil disaster a report issued in Western Australia yesterday indicated.

An investigation into extensive electricity blackouts in WA last May found that only one in 60 telephone calls made to the State Energy Commission was answered.

Because the telephone system became rapidly overloaded more than 1.7 million telephone calls were switched by Telecom to a "busy" tone to maintain its network viability.

As a result, according to retired Major General Ken Taylor, the electricity authority "did not realise the extent of the near catastrophic loss of power".

The figures "give a potent warning of the effects of natural disasters: of a need for review of all public authority contingency or counter disaster plans; of the vital role played by Telecom in emergencies and of the need for spare capacity in communications systems," he said.

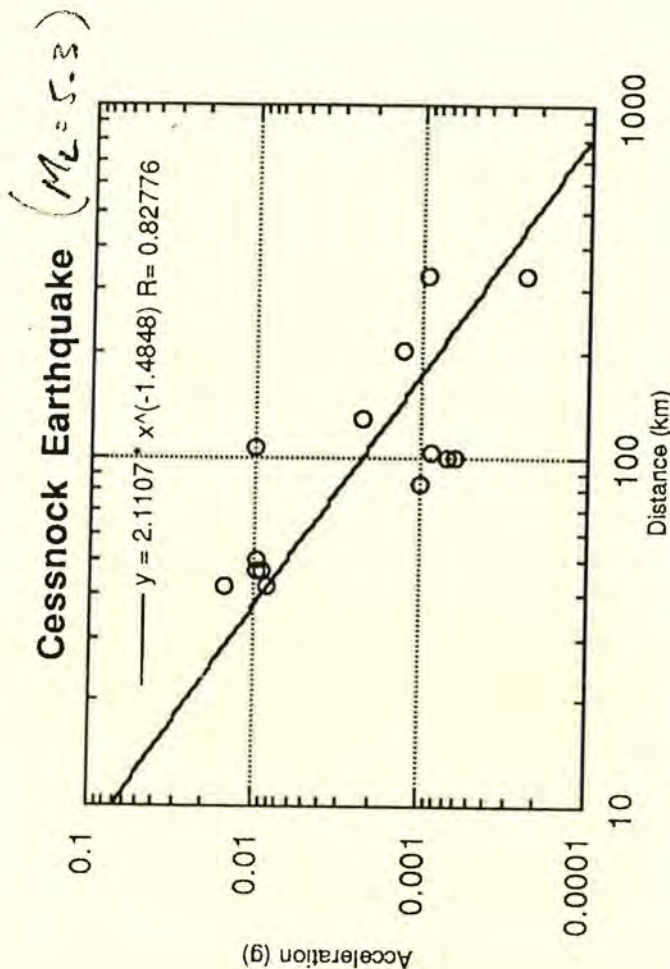
On the night of May 23 this year the south west of WA experienced the most severe storm for more than 30 years with winds peaking at 143km an hour and topping 50km an hour for more than 17 hours.

More than 300,000 electricity customers were denied electricity for 24 hours, thousands were still without power three and four days later and some were not reconnected for eight days.

Major General Taylor reported insurance claims at \$26.5 million, the direct cost to the State Energy Commission of Western Australia at \$3 million and estimated further general costs to the community at more than \$30 million.

His report savaged SECWA's management for failing to understand the severity of the problem and for failing to have adequate communications technology available to guide decision making. He said the organisation did not have a contingency plan to handle the storm. He was also highly critical of SECWA's public relations for not informing the public of the severity of the power supply damage.

He recommended major changes to SECWA's emergency operations, which Energy Minister Mr Colin Barnett has demanded the organisation begin implementing immediately.



Attenuation of peak ground acceleration with distance from the epicentre. The wide scatter is typical of areas with plentiful data such as NZ, USA and Japan.

# City sues for quake damage

By NICK PAPAIOPOULOS

The architect, the engineer and the builder of extensions to the Newcastle Workers' Club — which collapsed during the 1989 earthquake killing nine people — are being sued in what is becoming one of Australia's most complicated legal cases.

So far, the case involves 13 plaintiffs, two defendants and six cross-defendants and will run well into next year.

In the Supreme Court yesterday, Justice O'Keefe granted leave to the club and the Newcastle City Council to begin legal proceedings against the architect, Mr Clifford Johnston, the building company FH Compton & Sons Pty Ltd, the engineer, Mr Noel de Ferranti, and/or his company, Bull Ferranti & Collier Pty Ltd.

The section of the club which collapsed was designed and built in the early 1970s.

A total of 13 people died as a result of the earthquake on December 28, 1989 — the first recorded in Australia which resulted in human deaths — which registered 5.6 on the Richter scale and caused almost \$1 billion damage.

Another 13 people, who were injured in the earthquake, are suing the club and council for personal damages. Their cases will be heard at the Newcastle Supreme Court in November.

Furthermore, the club and the council are suing each other, claiming negligence. This case, along with the one involving the architect, the engineer and the builder, will run well into next year.

Mr John Timbs, QC, representing each of the 13 individuals on

behalf of the Legal Aid Commission, told the *Herald* yesterday: "Because some of these people are elderly and infirm we have decided to get their part in the proceedings over as soon as possible."

"But no adjudication will immediately follow because the issue of liability is going to be dealt with sometime in early 1995 as a separate issue."

In documents before the court, filed by the club and the council, it is alleged the engineer and/or his company were negligent because they provided plans and specifications which were defective, structurally unsafe and inadequate. It is further alleged that they failed to take into account "foreseeable structural stresses" such as that caused by an earthquake when they submitted the plans.

According to the documents,

the building company was negligent because it allegedly failed to carry out work in accordance with adequate plans and specifications. Similarly, it is alleged the architect ought to have known the plans submitted by the engineer were defective and had a duty to ensure that the drawings were verified and independently assessed, according to the document.

The former State Coroner, Mr Kevin Waller, who presided over a 12-day inquest into the deaths at Newcastle Coroner's Court in July 1990, had left the way open for civil suits when he handed down his findings.

"Whether any breach of duty is shown is a matter for our civil courts and not for a coroner, unless the breach is so grave that it amounts to a crime, which is not the case here," he had said.



We drove in a 4x4 vehicle to Tangshan with hosts Prof Zhou Yongnian, Mr Zhang Wenbo and Mr Wu Weilian and visited the Tangshan Seismic Data Exhibition Hall (built by the City Council after the Tangshan earthquake in 1976). The Director Madame Li welcomed us and hosted a tour of the Hall with its 2 m high model seismoscope and galleries of pictures of the damage, faulting and recovery. We installed a Kelunji and WLJ accelerometer in the basement of the Hall while its normal home in LeiZhuang was being refurbished.

Afterwards we were presented with a report by Wenbo and Yongnian; *Digital Strong Motion Accelerograms recorded by the instrument Kelunji/WLJ in Tangshan, China Part 1 (1991.10 - 1993.12)*, which has the records of an amazing 93 accelerograms, all from close small earthquakes in the magnitude range 1.5 to 4.5, six of them on both recorders.

The SSB would like more Kelunjis but have a familiar shortage of cash. (Of the 300 strong motion recorders in China, 100 were run by IEM, all of them in the Beijing and Tangshan area and most of these are analogue recorders).

IEM are undertaking an evaluation of the performance of 5 recorders (American (2), Russian, Japanese and the Kelunji) installed together at the Zhaogezhuang Mine site near Tangshan, before choosing which to adopt as their standard.

The SSB are considering a proposal to send a PhD student from China to work on the MOU project at the Seismology Research Centre RMIT and AGSO.

**Earthquake Engineering for dams in China** Kevin McCue and Gary Gibson visited the Institute of Water Conservancy and Hydro-electric Power Research in Beijing on 27 June. Senior engineer of the Institute and Vice President and Secretary-General of the Chinese National Committee on Large Dams (CHINCOLD) Dr Shen Chonggang talked about Chinese Dams, and their design. Current Chinese regulations date from 1978 and have been under revision for the last 2 years.

No dam in China has ever failed in an earthquake though Dr Shen acknowledged they were lucky in the magnitude Ms 7.8 Tangshan earthquake. A dam within 20 km of Tangshan and where the MM intensity was assessed as IX, was badly damaged. The crest settled more than 1 m and suffered large

longitudinal cracking. By good luck it was near empty which was unusual for that time of the year. The dam was repaired and is still in service.

In China 18 dams have experienced reservoir triggered seismicity, one an earthquake as large as magnitude 6.8. The possibility of induced seismicity is taken seriously at the Institute and new dams are instrumented accordingly.

Wang Lianxiang arranged a visit to their 5mx5m, 6 degree-of-freedom shake table with a capacity of 20 ton. The hydraulic actuators can be driven by sinusoidal vibrations or real earthquake time histories. The frequency range of the table is an amazing 0.1 to 120 Hz, the maximum displacement 40 mm horizontally and 30 mm vertically, and the maximum acceleration 1g horizontally and 0.7g vertically.

We were shown a model of an arch dam complete with water which had been shaken on the table to check the computer simulation of the effect on vertical construction joints. The dam was made of rubber, the abutments and base of steel to match the modelled rigid foundations. This work was done jointly with US consultants.

The table had been used for 62 model structures including traditional masonry buildings with a non-traditional sliding joint, a Black Mountain look-a-like, tall buildings and components of nuclear reactors. The table is available for outside consultancy work.

There are more than 20 000 dams in China above 15 m height, 28 of them higher than 100 m, and 250 new dams are built each year. Plenty of scope for Chinese dam engineers.

Afterwards we had a look at a locally built digital accelerograph designed by Academia Sinica. The recorder was a 12 bit, 3 channel tape recorder with a manually adjustable clock and no calibrator; the transducer a coil (the mass) mounted on leaf springs vibrating in a permanent magnetic field. The integrator must have been in the recorder. No match yet for the Kelunji. Some 30 of the instruments have been made so far and at least 2 records have been obtained, at 60 km from magnitude 4.5 and 6.5 earthquakes.

Don't forget the AEEs conference Canberra 14 & 15 November 1994 - your conference! The theme is 'Lifelines' A flyer with more details is enclosed with the newsletter.



## Australian Earthquakes, ML $\geq$ 3.0 May - August 1994

(from ASC, MGO, SRC-RMIT, SADME, TASUNI, UQ & UCQ)

### May

Seismicity was again low during May with only five earthquakes of magnitude ML 3.0 or greater, two of which were near Tennant Creek in the Northern Territory.

### June

Despite the increase in the number of recorded events, the seismicity was again low in June. (The yearly average is about 22 events, nearly 2 per month, of magnitude 4 or more, and nearly 10 times this number above magnitude 3). Two earthquakes were near Tennant Creek, the rest widely scattered. No damage was reported, although the onshore events were felt.

### July

There were 4 earthquakes over magnitude 4 this month, the first events of this size since April. The Eugowra event was the first of a reported earthquake swarm that was large enough to be located. The swarm continued into August. The 2 earthquakes in western Queensland were felt at Julia Creek but their epicentres are not well located because of the sparse seismograph coverage of this part of the continent.

Date	Time UT	Lat	Long	ML	Place
<b>May</b>					
08	04 17 15	19.9	134.0	3.0	Tennant Ck NT
14	14 33 35	38.7	143.5	3.0	Cape Otway Vic
21	08 59 18	35.9	146.9	3.0	Albury NSW
25	18 25 50	16.6	120.6	3.1	Off Broome WA
28	01 50 43	19.8	133.9	3.2	Tennant Ck NT
<b>June</b>					
16	19 18 52	19.8	134.0	3.3	Tennant Ck NT
17	11 52 34	20.2	148.9	3.2	Hayman Is Qld
19	02 24 43	33.2	138.4	3.2	Laura SA
23	03 40 08	19.9	133.9	3.9	Tennant Ck NT
23	13 55 27	34.9	117.7	3.0	Albany WA
26	07 36 03	33.6	133.8	3.2	Off SA coast
28	18 26 53	40.3	154.8	3.7	Tasman Sea
<b>July</b>					
4	09 10 17	19.6	141.5	3.8	Julia Creek Qld
5	19 07 22	20.1	141.6	4.2	Julia Creek Qld
8	18 40 33	30.6	138.9	3.3	Nepabunna SA
9	14 30 55	32.0	145.0	4.2	near Cobar NSW
12	20 29 16	35.7	137.5	2.9	Pennington Bay SA
13	13 51 12	19.9	134.1	4.1	Tennant Ck NT
22	00 49 23	19.8	133.8	4.2	Tennant Ck NT
31	12 30 53	33.5	148.6	1.8	Eugowra NSW

## COURSES & CONFERENCES

(copies of flyers from Hon Secretary if available)

- Australasian Structural Engineering Conference, 1994, Hilton Hotel Sydney 21-23 September 1994. AE Conventions Pty Ltd PO Box E181, Queen Victoria Tce, ACT 2600
- WEG Research Program University of Wollongong. Civil & Mining Engineering Short courses: Engineering Seismology 4 - 5 October 1994 \$500 and Geotechnical Engineering 5 - 7 October 1994 \$750
- **AEES Annual Seminar, November 14/15 1994, Institution of Engineers Aust, Canberra. 'Lifelines' is the theme of the afternoon-morning seminar.**  
**Contact: K McCue fax: 06 249 9969**
- 9JEES'94 The Japan Earthquake Engineering Conference, Tokyo, 12-14 Dec 1994.
- 7th Canadian Conference on Earthquake Engineering June 5 - 7, 1995 Montreal Quebec.  
Fax: 0011 1 514 340 5881
- 3rd Int Conf on Recent Advances in Geo-technical Earthquake Engineering and Soil Dynamics, St Louis, Missouri, USA April 2-7, 1995. Abstracts by Jan 31, 1995 to Prof Shamsheer Prakash, Civil Engineering, University of Missouri-Rolla, Rolla MO USA. fax: 314 341 4992, e-mail Prakash@novell.civil.umn.edu
- 5th International Conference on Seismic Zonation, Nice, France, Oct 17 - 19 1995. French Assoc. for Earthquake Engineering and Earthquake Engineering Research Institute.

### AEES & NZNSE

#### Pacific Conference PCEE '95

20-23 November 1995

Melbourne Vic Australia

## Recent publications

- *The Tornado, its structure, dynamics, prediction and hazards.* Eds Church, Burgess, Doswell & Davies-Jones. Geophysical Monograph Series 79. US\$85.00 (US\$59.50 for members AGU).
- *GIS and their applications in Geotechnical Earthquake Engineering.* ISBN 0-87262-973-2 ASCE Ed J David Frost & Jean-Lou A Chameau.
- *Earthquake tremors felt in the Hunter valley since white settlement* can be purchased for \$18.50 (+ \$1.50 postage) from Hunter House Publications, PO Box 536, Raymond Terrace, NSW 2324. (see review NZNSE Bull. 2 1993)
- **AGSO (BMR) Bulletins and reports on earthquake activity in Australia** can be purchased from the AGSO Sales Centre. The Australian Seismological Centre publishes an annual report featuring the year's seismicity with summary, glossary and description of the larger events.
- **Australian Seismicity (1900 - 1992) and Earthquake Hazard maps; 1:10M scale in colour.** (available from AGSO Sales Centre, GPO Box 378, Canberra ACT 2601 \$21 incl postage in Aust.)