The Editor AEES Newsletter
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AEES is a Technical Society of IEAust
The Institution of Engineers Australia
and is affiliated with IAEE

3/97

# AEES Newsletter

**Contents**



## AEES 1997 BRISBANE QUEENSLAND

Held on 2 & 3 October 1997 at the University of Queensland in Brisbane with the Theme: "Earthquakes in Australian cities - Can we ignore the risks?"

Russell Cuthbertson from the Organising Committee provided the following report.

The conference was held over two full days at the University of Queensland. When I say full days I mean exactly that for we squeezed in 31 talks as well as an AGM and a conference dinner. The papers presented covered a broad spectrum; from "internal" topics such as seismic monitoring, tsunami, microzonation, engineering design and materials testing, to topics that relate to broader fields such as loss assessment, insurance, vulnerability analysis and disaster management.

We were perhaps fortunate to have such a range of papers but in hindsight it may have been prudent to reduce the number of papers and allow more time for discussion. The problem then is which papers do you reject as a paper that does not read well does not necessarily mean it will not present well. There is also the corollary that papers that read well may not be presented well - but that is another "unknown"!

We could have decided to have only one invited speaker but I am sure that all the delegates would agree that both invited speakers presented talks that were informative, topical and entertaining. Professor Tom Paulay from New Zealand entertained us with his talk on the need to keep designs simple. Unfortunately Professor Dan Abrams, the head of the new Mid-America Earthquake Center, could not attend due to a last minute operation (surgical, not military!) but we improvised with a video link-up which worked exceptionally well. Dan spoke on a recent loss assessment project in Memphis that provided a counterpoint for some of the Australian work that was presented (eg the Cities project being carried out by AGSO and partners).

Dan made a comment, when referring to problems in getting theoretical and measured results to agree, that one should only worry about getting a basic agreement and not spend time in trying to achieve perfect agreement. The assumptions involved made the results only a guide anyway and so only "ballpark" figures were warranted. It was uncanny that this idea was also expressed by Tom Paulay in his talk on simplicity in design but I was assured there was no prior collusion between the two!

To reduce the length of the program we thought about having one or more parallel sessions. The problem here is that there is always someone who will want to attend two simultaneous talks. There has always been a gap between engineers and seismologists (with insurance people either in between or perhaps off to the side!) and we intentionally mixed up the sessions so that everyone was exposed to the talks from outside their direct area of interest. We see the annual conference as an important vehicle to achieve this interplay of ideas and interests between the various "sub-groups" of the Society. We also trust that Nelson Lam will continue to act as a go-between and entertain us with his interpretations of the situation!

We were fortunate for the first time to have the Proceedings available in time for the conference. Given the hassles involved I can well understand why this was not achieved in the past. Of the 33 papers in the Proceedings we managed to get 31 extended abstracts (some more extended than others!). You can see a list of titles on the AEES conference web page (http://QUAKES.earthsciences.uq.edu.au/AEES97.html).

The conference was well attended with 89 delegates (49 from Queensland, 34 from interstate and 6 from overseas) and even though the accounts are not yet finalised we trust we should see some profit. While a profit is a bonus, the main aim of the Annual Conference should be simply to get all members of the Society together to exchange results, ideas and opinions (and have a good time while they do it!). We would like to think we achieved that this year in Brisbane.

See you all next year in Perth - Russell

## AEES AGM 1997

The Annual General Meeting of the Society was held in Brisbane on Thursday 2 October prior to the Conference Dinner. Professor Hutchinson chaired the meeting which was attended by 23 members. The minutes of the previous AGM in Adelaide were accepted as published in the Newsletter. The

Treasurer John Wilson presented his report which showed an alarmingly declining financial membership but a reasonably healthy bank balance. He noted that the Adelaide Conference, a great success scientifically, had only broken even financially. The President moved in his report that some of the capital be used to (i) support reconnaissance missions following large earthquakes in the region to a maximum of $3000 in 3 years and (ii) to encourage student participation by partially subsidising travel costs limited to $1500 per year and $500 per student presenting a paper. Both motions were agreed on the voices.

The election of a new Executive, essentially the old team reelected except that Vaughan Wesson, Civil and Software Engineer, replaced Gary Gibson as Honorary Secretary. The team is shown opposite.

The location of the next meeting in 1998 was selected in order of preference: Perth†, Hobart, Sydney, the order depending on whether an organising committee could be found in Perth and in the knowledge that the 1999 Conference would be held in Newcastle (10th Anniversary of the earthquake).

The Brisbane organising committee Russell Cuthbertson, Bill Boyce, Col Lynam and Steve Jaume from the University of Queensland and Barbara Butler from Melbourne University were warmly thanked by the meeting on the President's motion. For the first time at an AEES Seminar, registrants were presented with previews of the talks rather than the proceedings later for which they were commended.

The meeting encouraged Col Lynam to proceed with his proposal to establish a State Branch of AEES within IEAust in Queensland, which will be watched with interest.

Dr George Walker mentioned that a National Hazards Mitigation Strategy was being developed and suggested that AEES should get involved. Prof Hutchinson said he would initiate contact with Alan Hodges, the Director of EMA. The meeting then closed for members to go to the Conference dinner.

† Peter Gregson (AGSO Mundaring), Peter Gow (Building Management Authority) and Julian Yates (WA SES) plus one IEAust nominee have formed a committee to organise the 1998 Meeting in Perth in November *Meckering 30 years on*. Book now!

## Your Society - AEES

**Executive:**

**President**: Prof Graham Hutchinson[1]
**Secretary**: Vaughan Wesson[2]
**Treasurer**: John Wilson[1]
**Immediate Past President**: Charles Bubb
**Secretariat:** Barbara Butler[1]

**Committee:**

Russell Cuthbertson (Qld)
Peter Gregson (WA)
Vagn Jensen (Tas)
Michael Neville (NSW)
Mike Griffith (SA) and
Kevin McCue (ACT)

[1] Civil & Environmental Engineering Department, Melbourne University, Parkville, Vic 3052
[2] Seismology Research Centre, RMIT Bundoora, 3083

**Selection of National Delegate and Deputy Delegate** Executive selected Prof Hutchinson, AEES President, as the National Delegate and Gary Gibson deputy Delegate to represent AEES at the International Association for Earthquake Engineering meeting in New Zealand at the year 2000 WCEE.

**Zone 0** We might have been premature in reporting in the last Newsletter the demise of zone zero in the USA earthquake zone map. A revised simplified version of the map has a 0 - 2% hazard rating through much of middle America.

## NUGGETS FROM THE NEWSGROUP A REGULAR FEATURE BY CHARLES BUBB

*Alan Jones is a highly regarded professional contributor to the Earthquakes Newsgroup. He describes below his exhibit in the National Museum of Natural History. Also you can download his programs 'Seismic Eruption' and 'Seismic Waves' from his home page:* I have just returned from Washington DC where I attended the opening of the new Janet Annenberg Hooker Hall of Geology, Gems, and Minerals exhibit in the National Museum of Natural History. The star of the new exhibit is, of course, the Hope Diamond which is a new, beautiful display case that allows you to view it from all sides.

The plate tectonics section has my Seismic/Eruption program running continuously on a 42 inch monitor illustrating how earthquakes and volcanic eruptions define the earth's tectonic plate boundaries. There are two volcanic study stations and two seismic study stations. The volcanic stations allows one to display many of the volcanic eruptions in the Global Volcanism Program database of the Smithsonian. There is a very popular quiz (which they astutely call a "game") that asks question about volcanoes. You can select various parts of the world to see eruption activity displayed via Seismic/Eruption. On the seismic study stations you can display where and when earthquakes occur again using Seismic/Eruption. You can also see how sesmic waves propagate through the earth with my Seismic Waves Program.

There is a huge globe with the oceans drained illustrating plates and plate boundaries. There are lots of computer interactives. One has the famous photos of the Mt. St. Helens eruption but morphed by computer to make a smooth movie.

An lots, lots more. If you are in the Washington DC area, be sure to look in. I believe this exhibit will knock your eyes out. You can fetch Seismic/Eruption and Seismic Waves from my home page: http://www.geol.binghamton.edu/faculty/jones

*Earthquakes induced by human actions*

I would highly recommend that you visit the Induced Earthquake Bibliography where you will find hundreds of references:
http://www.nyx.net/~dcypser/induceq/induceq.html or
http://members.tripod.com/~dcypser/induceq/induce.html Darlene A. Cypser dcypser@netcom.com
Attorney at Law

*Charles*

*The AEES subscription year is from 1 Dec to 30 November. It is difficult and expensive to send each member an individual reminder that fees are due so please help us by sending your subscription for 1997/98 to AEES (attn: John Wilson, Civil and Environmental Engineering Dept, Melbourne University Parkville Vic 3052) or renew through IEAust's annual subscription system by marking AEES your preferred Society. If you change address or if you know a member who is not receiving the newsletter please advise the Secretary, many newsletters are returned.*

## 1997 AEES Brisbane Conference Proceedings

The cover of the Proceedings reflects the theme of the Conference: Earthquake Risks in Australian Cities. The volume is available now and at a very reasonable price. To both learn about earthquake engineering issues and support the Society place your orders now with Barbara Butler ($30 + pp).

## SPECIAL OFFER ON CONFERENCE PROCEEDINGS

We are having a clearance sale which you will find irresistible. Simply complete the form below and send to Barbara Butler: fax: 03 9348 1524

Please send to me the following publications at the special price listed, plus postage.

- Proceedings of the 1992, 1993 and 1994 Conferences $20.00 / pack of three
- Proceedings of the 1995 Pacific Conference on Earthquake Engineering 3-Volume set $90.00 per set
- Proceedings of the 1996 Adelaide Conference $12.00 each

Invoice and publications to be sent to:

Name .....

Address .....

.....

City .....State.....

Postcode .....

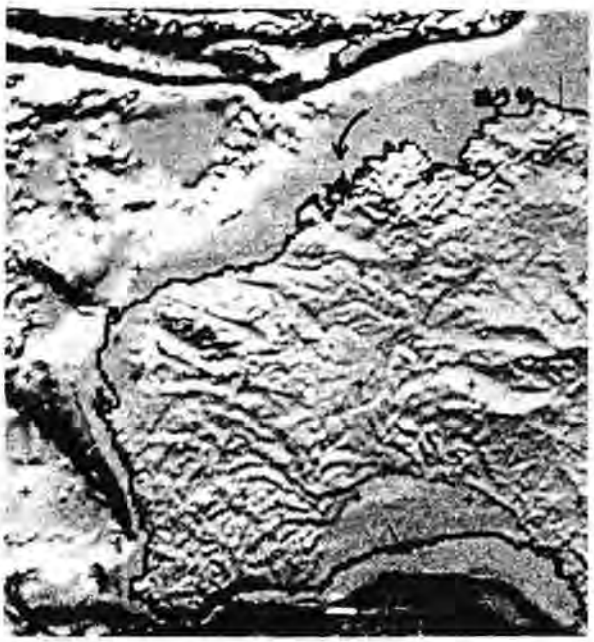
## COLLIER BAY WA EARTHQUAKE 10 AUGUST 1997 at 09:20:35 UTC

The last Newsletter reported that seismic activity in Australia had quietened down to normal levels - a premature report. The largest Australian earthquake since February 1988 struck an isolated area of Western Australia at 5:20pm WST on 10 August (see figure below for location). Its magnitude was Mw 6.3, similar to the earlier two 1988 Tennant Creek earthquakes and the 1979 Cadoux WA earthquake. The focal depth was less than 10 km, but any surface faulting was obscured beneath the sea. Surface faulting at Cadoux extended for 14 km which is the expected length of the causative fault under Collier Bay.

The mechanism as computed by NEIC and Harvard is strike-slip with the principal stress acting horizontally at N75°E ± 10° ie ENE with faults trending N22°E and N105°E with similar uncertainties. On the BMR 1:250000 Yampi Geological Map the N22°E direction parallels basement faults in the adjacent onshore Proterozoic rocks of the Kimberly Block in which case faulting would have been entirely offshore. Had there been slip on the complementary fault, the displacement could have extended onshore though uncertainty in the epicentral location is about ±16 km so faulting could still have been completely submarine.

After the mainshock there were only three aftershocks large enough to be detected on the National Network, all of them smaller than ML4.0 (see table below). A temporary network of seismographs was installed by AGSO-Mundaring's Owen McConnell and SRC's Wayne Peck in the hope that aftershock locations could help to locate the epicentre and focal depth more accurately and identify the fault plane. The field instruments were being collected in mid October.

Concrete spalled off footings of old weatherboard mining houses on Cockatoo Island nearly 75 km west of the computed epicentre (see photos). There appear to be no stirrups and the steel reinforcement rods are not continuous to the base of the footing so the columns had little resistance to lateral forces but even so the houses must have swayed significantly. There was little else to be damaged in the region, no major towns or infrastructure. At this distance the intensity was assessed at VII on the Modified Mercalli scale.



There are interesting observations of widespread rock falls near the epicentre both on offshore islands and the mainland, some of which are reported to have triggered bushfires. The earthquake was felt onboard many boats in the area, both fishing boats and one

geophysical exploration vessel. AGSO and SRC seismologists Peter Gregson and Wayne Peck are drawing up an isoseismal map based on personal interviews, inspections and postal questionnaires.

Australia has been fortunate to again escape serious damage and possible lifeloss. The magnitude was greater than that of the recent Italian earthquakes or of the 1989 Newcastle earthquake and only the isolation of the epicentre from major urban areas prevented a disaster.

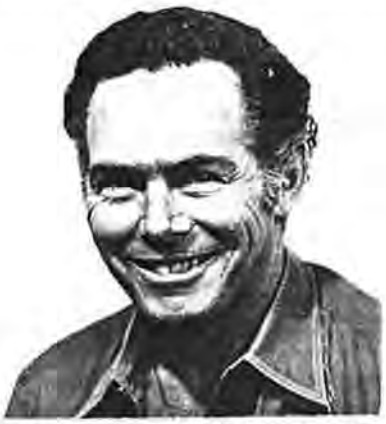
**1997 Earthquakes in Australia (cont.)**

| DD | UTC | Lat | Long | ML | Place |
|---|---|---|---|---|---|
| July | | | | | |
| 01 | 060611.8 | -21.42 | 115.64 | 3.2 | NNE Onslow WA |
| 05 | 192326.3 | -19.91 | 134.13 | 2.9 | Tennant Ck NT |
| 08 | 100122.4 | -31.59 | 153.06 | 3.7 | Pt Macquarie NSW |
| 08 | 213438.2 | -28.46 | 114.33 | 4.2 | Geraldton WA |
| 21 | 151043.3 | -32.69 | 137.79 | 3.8 | Pt Augusta SA |
| 23 | 182948.7 | -22.11 | 126.54 | 3.6 | Tobin Lake WA |
| 26 | 063332.7 | -31.99 | 141.43 | 3.1 | Broken Hill NSW |
| 29 | 074256.4 | -28.45 | 125.80 | 4.2 | Warburton WA |
| 30 | 153003.4 | -28.09 | 142.60 | 3.2 | Grey Range Qld |
| 31 | 191410.6 | -17.32 | 123.28 | 3.0 | Derby WA |
| August | | | | | |
| 06 | 225928.8 | -19.80 | 134.01 | 3.4 | Tennant Ck NT |
| 07 | 124600.2 | -33.80 | 149.96 | 2.5 | Lithgow NSW |
| 10 | 092031.0 | -15.92 | 124.27 | **6.3** | Collier Bay WA |
| 11 | 1412 32.1 | -15.71 | 124.15 | 3.8 | Collier Bay WA |
| 12 | 1811 52.4 | -24.65 | 111.13 | 3.0 | Collier Bay WA |
| 14 | 0855 8.2 | -16.04 | 124.28 | 3.2 | Collier Bay WA |
| 17 | 1305 35.3 | -17.15 | 121.78 | 3.1 | Broome WA |
| 20 | 1817 02.1 | -17.70 | 117.02 | 4.0 | W Dampier WA |
| 23 | 001241.7 | -34.60 | 148.28 | 3.1 | Harden NSW |
| 23 | 173037.1 | -41.54 | 146.41 | 4.2 | Launceston Tas |
| 25 | 223223.1 | -38.51 | 144.71 | 2.5 | C Schanck Vic |
| 30 | 185527.7 | -18.29 | 118.69 | 3.3 | W Pt Hedland |
| 31 | 0800 57.5 | -31.45 | 117.67 | 2.9 | Kellerberrin WA |
| 31 | 1523 50.3 | -31.45 | 117.68 | 4.6 | Kellerberrin WA |
| 31 | 1550 31.6 | -31.45 | 117.68 | 3.6 | Kellerberrin WA |

## WCEE 2000
## AUCKLAND NEW ZEALAND

The New Zealand National Society for Earthquake Engineering will host the next World Conference on Earthquake Engineering in Auckland in the year 2000.

## Obituary Ian Everingham 1924-1997



Not without a struggle he died, just before his 73rd birthday. Ian Bouchier Everingham was one of those characters who enjoyed life to the full, had a deeply enquiring mind, loved his geoscience, and worked and played hard.

His wife June of nearly 30 years has lost a friend, companion and fellow-traveller.

Geophysics was a second love which Ian pursued after demobbing from the RAAF where he trained as navigator. He used gravity anomalies to map features of the crust and upper mantle for his 1968 Msc thesis at the University of WA and his first publication. Ironically his last publication, an AGSO Record in press, deals with the correlation of earthquakes with gravity and magnetic anomalies in the southwest WA crust and this will soon be released.

To collect the data for this MSc, Ian and June used to head off into the never-never in his old Falcon on weekends, gravity meter and carton of beer on board. Much of his working life was spent in remote areas without the support of colleagues and libraries. He recorded and watched one of the Maralinga tests at a temporary seismograph site in the Nullabor where he first encountered Bruce Bolt. These recordings resulted in the first seismic study of crustal structure in Australia.

His contributions to seismology were most important, the joint paper in 1968 with Doyle and Sutton the *Seismicity of the Australian Continent* was the seismologists bible for many years. His study of the 1968 Meckering earthquake was a classic and a fitting launching pad for his redeployment to Papua New Guinea. As OIC at Port Moresby Observatory from 1970 he directed studies of large earthquakes, tectonics and tsunamis and the resulting publications are referenced in all contemporary studies of hazard in PNG. He was lucky to have been in PNG during the most seismically active decade of the century, earthquakes that included the 1970 Madang, the two 1971 Solomon Sea and 1975 Bougainville earthquakes which he studied and documented.

Whenever he needed a break Ian would head off singlehanded on a 30 foot catamaran accompanied by their small terrier, and sail up to Galley Reach or some other favourite spot, drop anchor and contemplate the infinite. He was an accomplished sailor and navigator. Ian hosted many an enjoyable picnic at Hombrum Bluff with visitors from all over the world who learned the dark secrets of SP greenies and brownies.

Ian and June had 2 years in Canberra before retiring from BMR and moving to Fiji in 1981 where he again did all the basic research into the seismicity, tectonics, crustal structure and earthquake and tsunami risk there, the results published in numerous papers, databases and reports. Much of the field work he turned into pleasure, commandeering a navy boat to sail around the islands dropping explosives overboard to measure seismic wave velocities in the crust and upper mantle. He joined the Suva yacht club and sailed around in another, smaller catamaran but without his trusty terrier crew. I well remember a leisurely downwind spinnaker run back into Suva after a picnic on an offshore island.

Retiring back to Perth in 1987 Ian continued to provide ideas for research into the causes of earthquakes right up to the time of his death when he was working on microzonation of Perth using detailed intensity data.

Ian was a warm and generous man, in PNG he would drive distressed observatory staff to their villages at all hours of the day or night to visit sick relatives and was forever lending (giving) them money. He overcame much sadness, the accidental deaths of both sons in their 20's for example and a serious illness but remained positive, happy and gregarious throughout, sailing and partying till he dropped.

Commiserations to June, the Southwest Pacific where he lived and worked is a richer place for his having been here.

## CURRENT RESEARCH: EARTHQUAKE ENGINEERING and ENGINEERING SEISMOLOGY IN AUSTRALIA

This is the third Newsletter article to communicate what is happening in relevant Research Institutions around Australia, the first being Adelaide University, then Melbourne University and now:

### Seismology Research Centre at RMIT

The Seismology Research Centre (SRC) at Royal Melbourne Institute of Technology undertakes a range of research and consulting work in the application of earthquake seismology to geological and engineering problems. The centre was established in 1976, and its work is primarily concerned with the measurement and analysis of vibrations, particularly those due to earthquakes.

The SRC has a staff of ten, working in seismology, instrumentation and software development. In addition, several students are working on Masters and Ph.D. projects including earthquake ground motion studies, earthquake hazard assessment, seismological instrumentation and calibration, and earthquake analysis software. Training programs are provided for earthquake observatory staff in both seismology and technical support.

Equipment and Analysis Software

The centre is continuing to develop its fourth generation digital seismograph, the Kelunji D Series, with the second batch of 25 units available in early 1998. The third generation SRC digital seismograph, the Kelunji Classic, has been installed in over 190 locations throughout Australia, and in Asia and the Pacific.

Digital seismology requires considerable computer support and the centre has developed programs for the replay and analysis of seismograms. These programs include determination of earthquake location, magnitude and mechanism, support of a computer based earthquake catalogue, calculation of earthquake ground motion recurrence and the response of structures to this motion, and production of synthetic accelerograms for design purposes at particular locations.

Recent software includes programs for earthquake preparation, alarm and response that alerts authorities to the likely effects of an earthquake, and of the appropriate preliminary actions the authority should undertake to respond to this particular earthquake. This is based on earthquake hazard information provided by the seismologist and seismograph network, combined with vulnerability information provided by the client and earthquake engineer, and response tasks supplied by the client.

Seismograph Network

The SRC operates a network of 90 permanent seismographs and accelerographs in Victoria and New South Wales plus about 10 portable instruments, and locates over 400 earthquakes within the network each year. Most of these earthquakes are too small or too deep to be felt, but they do provide information on relative levels of earthquake activity, and delineate active faults. Most of the instruments are operated for owners of large dams, power stations or other structures, with the SRC providing routine operation, maintenance, analysis of data, and preparation of routine reports.

Most of the recorders are triggered digital instruments, and emphasis has been placed on using a wide dynamic range so that both small and large earthquakes can be recorded without the instruments going to full scale. They are optimised to measure higher frequency seismic waves than are normally recorded by regional seismographs.

Many of the latest instruments are six-channel digital recorders with a sensitive three-component seismometer and a strong motion three-component accelerometer. The one instrument will then record all levels of ground motion from background noise up to an acceleration of $\pm 1$ or 2 g.

Data from eleven of the recorders are telemetered continuously to the centre, and an automatic paging system is used to alert staff a couple of minutes after larger earthquakes are recorded.

Portable recorders are used for special projects such as recording blasts, measuring the vibration response of structures, or for installation in the epicentral area of larger earthquakes to allow precise location of aftershocks.

Consulting

The centre has produced earthquake hazard estimates for many major engineering projects, especially large dams, power stations and mines in Australia, Papua New Guinea, Africa, Indonesia, Thailand, Laos, Nepal, China and the Pacific. The following consulting services are provided:

- Ground motion recurrence statistics, the most useful form being a series of spectra corresponding to ground motion for a range of return periods. The latest program developed at the SRC includes magnitude contributions for ground motion recurrence, particularly useful in liquefaction studies.

- Specification, design, supply, installation, operation and data analysis of a seismograph network, with emphasis on local and regional networks.

• Implementation and support of a system for earthquake preparation, alarm and rapid response.

• Calculation of synthetic accelerograms which include local information gained from seismograms of small earthquakes.

• Information on the amplification effects on ground motion of near surface sedimentary rocks and topography at a particular site.

• Measurement of dynamic properties of a structure, including natural frequencies and damping at low strain, by measurement of its response to earthquakes, artificially generated motion, or ambient motion.

Current Projects

Incorporation of geological information in earthquake hazard analysis is one of the main themes of the work of the SRC at present. This includes consideration of palaeoseismicity (pre-historic earthquakes), neotectonics and Quaternary geology in constraining the parameters used for earthquake ground motion recurrence estimates. It also includes using geological input to describe earthquake hazards other than ground motion recurrence, such as earthquake induced landslides or rockfalls, surface rupture, liquefaction, tsunami or seiches.

A long term project is to develop realistic and appropriate earthquake strong motion spectra for Australian conditions. This needs more information about the source mechanisms of Australian earthquakes, and the variation in attenuation of seismic waves across Australia. The source spectral shape of earthquake motion is magnitude dependant, with higher proportions of the energy from smaller earthquakes being at higher frequencies. The source spectrum from a magnitude 7.0 earthquake will be much the same for earthquakes in Australia as elsewhere, especially if the source mechanism is similar. At a particular location in an active area, such an earthquake may occur every few hundred years, but at a site in Australia it may only recur after intervals of hundreds of thousands of years. The earthquake that occurs every few hundred years near most places in Australia is of moderate magnitude (usually 5 to 6), but it is not necessarily appropriate to use the spectral shape from such an event for design purposes because low frequency motion from larger more distant events will also be experienced at the site.

In instrumentation, to improve the reliability, versatility and flexibility of a seismograph network, the concept of "networking seismograph networks" or "holonic seismograph networks" is being developed. The idea is that as many elements of a seismograph system as possible should be both autonomous and cooperative. This accepts that a failure in any particular system element may occur for any of a multitude of reasons, but that the tasks of the network can be temporarily maintained by other elements in the system, and that knowledge of the failure is made available as soon as possible to allow repair.

More information about the activities of the Centre, plus news of the latest earthquakes in south-east Australia are available on the web site http://seismology.sm.rmit.edu.au

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Email: seismology@rmit.edu.au

## The Recent Earthquakes in Italy

A magnitude 5.6 earthquake struck an old town famous for some of its heritage buildings, mainly domestic dwellings and churches, the majority of them masonry construction. Eleven people died in the collapse or partial collapse of some of these buildings, 115 were injured and 5000 were made homeless. There was rubble everywhere according to one survivor.

This description could have been Newcastle rather than Italy but the sequence of events in Italy then changed compared with that in Newcastle. Six hours after the first earthquake, another larger earthquake of magnitude Mw 5.9 struck causing more damage and further casualties including two engineers and two priests killed whilst inspecting the ruins inflicted by the first earthquake on the Basilica of St Francis of Assisi. Aftershocks are continuing as we write this newsletter, each one adding to the damage and suffering.

The total damage bill in Italy is expected to exceed $1billion as did that in Newcastle.

In Newcastle residents felt only a single small aftershock though seismologists from Australia and New Zealand advised the Newcastle Lord Mayor's Emergency Response team that the occurrence of damaging aftershocks was highly probable given the previous history of extensive aftershock sequences following Sydney Basin earthquakes in 1961 and 1973.

A State of Emergency was declared in Italy but for one reason or another this didn't happen after Australia's most costly natural disaster causing difficulties with the response and recovery phase of the relief operation.

Some of the geological differences are notable: the Italian earthquake had a normal faulting mechanism whilst that in Newcastle had a reverse faulting mechanism, and in Italy the fault just propogated to the surface where the displacement was about 10 mm whilst it remained a blind thrust in Newcastle.

The previous Newcastle earthquake occurred in 1925 (and 1868 before that) whereas the epicentral area of the Italian earthquake had to wait 700 years after the last similar destructive event there in 1279.

Is the Italian scenario a reasonable scenario for an Australian city such as Newcastle or Sydney? On what basis should Italian seismologists have been able to forecast the earthquake pattern and so saved the lives of the two engineers and priests assessing damage? Engineers and architects in Italy and Australia are required to design and build new buildings to resist earthquakes based on the latest

available knowledge but to what extent should existing buildings including houses, ie the great majority of buildings, be strengthened to resist earthquakes? The next ML 5.6 earthquake in an Australian urban area will cause a repeat of Newcastle.

A description and pictures of earthquake damage in Italy can be viewed at
http://www.geofisico.wnt.it/lastnews/970926/smistamento.html

## FORTHCOMING CONFERENCES

(Flyers for some conferences are available from Ed)

• **1997, 4 - 5 December Marysville Vic Australia** Conference on Geological Structures and their Geophysical Signatures. Hosted by the Specialist Group in Solid-Earth Geophysics, the Specialist Groups in Tectonics and Structural Geology of GSA and IGCP 383. Dr Greg Houseman Dept Earth Sciences, Monash Uni, Clayton Vic 3168 Aust

• **1998, 27 - 29 March Wairakei Resort New Zealand** NZNSEE Annual Conference 'Reducing Earthquake Risk and Encouraging Preparedness - Who is responsible? Admin Sec PO Box 312 Waikanae NZ ph/fax 64 4 293 3059

• **1998, 27 - 30 April Santiago CHILE.** International Conference on 'Modern Preparation and Response Systems for Earthquake, Tsunami and Volcanic Hazards' IUGG Chile National Committee email: seisvolc@conf.dgf.uchile.cl

• **1998, 6-11 September; Paris La Défense France, 11th European Conference on Earthquake Engineering.** Organised by EAEE, information at http://dfc2.enpc.fr/ecee11 (flyer available - Ed)

• **1999, 19 - 30 July, Birmingham, England, UK.** The Tsunami Symposium will be held in conjunction with IUGG99. The 22nd General Assembly of the International Union of Geodesy and Geophysics (IUGG will be held at the University of Birmingham. Register your name and address at: http://www.bham.ac.uk/IUGG99

• **2000 - WCEE/PCEE Auckland New Zealand** - Watch this space.

## NEW BOOKS / REPORTS

Acceptable Risks for Major Infrastructure. Eds P Heinrichs and R Fell, Balkema 1995. Proceedings of the Seminar on Acceptable Risks for Extreme Events in the Planning and Design of Major Infrastructure. Sydney NSW Australia, 26 - 27 April 1994.

Report on the January 17, 1995 Great Hyogo-Ken Nambu (Kobe) Earthquake. Lam Pham & M Griffith. CSIRO DBCE 95/175(M).

The Catastrophe of Mt Gambier's Earthquake. Published and written by Ronald L Thomson, Mt Gambier 1996. 44pp.

Earthquake Engineering *Proceedings of the 10th European Conference*, Vienna Austria 28 Aug - 2 September 1994, Balkema, Ed G Duma, price $593.00

Tsunami - Progress in Prediction, Disaster Prevention and Warning in *Advances in Natural and Technological Hazards* Eds Yoshito Tsuchiya & Nobuo Shuto. Kluwer Academic price $240

Isoseismal Atlas of Australian Earthquakes - Part 3 AGSO Record 1995/44, $50 + pp. AGSO Sales Centre phone: 06 249 9519, fax: 06 249 9982

Australian Seismological Report - 1994 AGSO Sales Centre ph: 06 249 99519, fax: 06 249 9982

Fundamentals of Earthquake Prediction by Cinna Lomnitz: John Wiley & Sons.

The Geology of Earthquakes by R.S. Yeats, K.E. Sieh, and C.R. Allen: Oxford University Press, 576 p., price $65.00.

Paleoseismology, edited by James P. McCalpin. Academic Press, 576 p., price $89.95.

## IDNDR Project RADIUS

In case you wondered RADIUS means Risk Assessment Tools for Diagnosis of Urban Areas against Seismic Disasters. It is the name of a project launched by the IDNDR Secretariat of the UN with the Japanese Government to promote worldwide activities for the reduction of earthquake disasters in urban areas. In each of the 10 cities selected for a full year and a half long case study financial support of US$40 K - $50K will be provided to the local government and $10K to $20K for an associate case study. It is expected that any supplementary budget will be provided locally.

The mayor of the selected city will nominate a government official and a professional as counterparts who will coordinate the study in collaboration with a local institute or university.

The case studies are expected to start at the beginning of 1998 so there isn't much time.

For more information and/or application forms you can contact the IDNDR Sercretariat at:
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or your Hon Editor.

## OVER THE LINE