

## LOMA PRIETA EARTHQUAKE

# Safer structures take priority

**San Francisco**

IN the wake of the Loma Prieta earthquake, Congress has already provided an extra \$20 million for seismic research and more seems sure to follow. Now the debate is over how best to spend new funds: early indications are that the emphasis will be on applying existing knowledge to making buildings safer, rather than on rushing to improve the art of earthquake prediction.

Last week, the debate surfaced when scientists, engineers and emergency-response officials testified before a congressional subcommittee that convened at the annual meeting of the American Geophysical Union (AGU) in San Francisco. The mission of the subcommittee on science, research and technology was to help to assess the lessons learned from the 17 October earthquake and plan future funding for the National Earthquake Hazards Reduction Program (NEHRP).

For the most part, testimony was along predictable lines, with seismologists and geophysicists wanting more research on earthquakes and earthquake prediction

other high risk areas as well. Such a project would cost about \$50 million over 10 years in California alone, he estimated.

Taking the other tack was Chris Poland, senior principal of H. J. Degenkolb Associates, Engineers, a San Francisco-based company. Poland argued that there is already a wealth of seismological information that has not been applied in engineering design and that new funds would be better spent in this area. He said this is especially true after the Loma Prieta earthquake, which provided a real-life, strong-motion test of existing theories.

By all yardsticks, NEHRP has received short shrift over the years. The programme was established by a 1977 Act of Congress to advance scientific understanding of earthquakes and drive the practical application of that understanding. Initial funding was \$53 million, equivalent to \$94 million in 1989 dollars. Yet funding for 1989 was just \$66 million, meaning the budget has fallen almost 50 per cent in real terms. No change was expected in 1990. But in the wake of the Loma Prieta earthquake, Congress approved an additional \$20 million, bringing the total appropriated to just over \$87 million.

"All funding for NEHRP has been disappointingly small in comparison to what the original plans were for the programme", said Representative George Brown Jr (Democrat, California), one of the original architects of the programme and a longtime supporter of seismological research. Brown said that he interpreted the field-hearing testimony as indicating that the applications aspect of seismological research had lacked support. Structural research and the development of new building codes and other regulations have not been given as much emphasis as they should, he said.

The principal agencies receiving NEHRP funding are the Federal Emergency Management Agency, the US Geological Survey (USGS), the National Science Foundation (NSF) and the National Institute of Standards and Technology (NIST). Traditionally, the prediction-oriented USGS has dominated the budget, receiving about half of all NEHRP funds. At the other end of the spectrum is NIST, which undertakes a variety of structural research projects. For the past three years NIST has seen its budget frozen at \$525,000 — less than one per cent of the total NEHRP budget.

That percentage is something Congress looks set to change. Of the \$20 million in additional funding approved after Loma Prieta, NIST received \$2 million. NSF, which is also involved in some earthquake engineering research projects, received another \$3 million — the same as the allocation for USGS.

**Robert Buderl**

were greatly concerned about the recent suggestion by James Watson, director of the US National Institutes of Health Center for Genome Research, that countries failing to contribute financially to the project should be denied access to US genome data, a criticism clearly directed at Japan.

Last month Matsubara replied to Watson's criticisms in *Nature* (*Nature* 342, 463; 1989). But Yoji Ikawa, head of the RIKEN genome project and another HUGO member, says that the Japanese government should issue an official reply to Watson, because he is both a scientist and a representative of the US government. And it is Ikawa's opinion that the Japanese government should first come forward with funds for an international organization that scientists will then run. Others, including Matsubara, think that the scientists themselves must take the initiative.

Behind these arguments lies a battle between scientists and the various government ministries and agencies over who should take the lead in the Human Genome project. Itaru Watanabe, vice-president of the Science Council of Japan, an elected body of 200 academics, says he is greatly concerned about this growing factionalism which he says shows that Japan has no coherent science policy. The Science Council has recently suggested that a new organization should be established to coordinate the human genome research effort. But the council has lost a great deal of its political power since it was re-organized by former Prime Minister Yasuhiro Nakasone.

Younger researchers at the meeting were more concerned about who will actually do the sequencing. As one young scientist said, they are the ones that will probably have to do "the road construction work" and they are worried they will be ordered by their superiors to look at sequences in which they have no interest, a legitimate concern in Japan where professors wield considerable power over their junior staff.

But Oishi and others attending the meeting in Sendai think that much of the sequencing can be carried out by system engineers and companies using new sequencing technology. This is the key philosophy behind the STA project initiated by Professor Akiyoshi Wada in 1981 who believes that sequencing is a job for machines not scientists. Matsubara hopes that MESC will establish new funds for such contract research.

But it is uncertain just how soon such companies will be established in Japan. Matsubara noted that while he has been approached by many US companies since he became vice-president of HUGO, not one Japanese company has come to him to enquire about the project.

**David Swinbanks**

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Unsafe structure: a Highway Patrol officer surveys the Oakland Bay bridge soon after the collapse (AP)

and engineers seeking to shore up the structural lines of defence. "We really have not measured enough things with enough instruments", AGU president Don L. Anderson, a geophysicist at the California Institute of Technology, said after the hearing. He said it might be foolish to focus new research moneys on building design and reinforcement, "because the engineers cannot really design a safe structure unless they know what the earthquake is going to do and what the geology is going to do". Anderson testified before the subcommittee in favour of what he called a "research array", a series of up to 100 broadband digital seismometers around California — and eventually in Alaska, Hawaii and