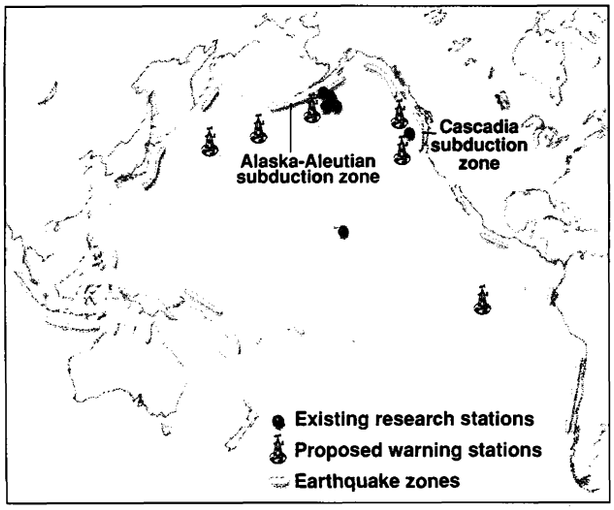

Existing and planned tsunami monitoring stations. The network focuses on regions posing a direct threat to coastal communities of the United States. Research stations do not report in real time. Two of the six real-time reporting stations are scheduled for deployment in July 1997.

the tsunami warning centers that will be exchanged among them by way of the Internet and dedicated intranets.

In 1986, NOAA's Pacific Marine Environmental Laboratory started measuring tsunamis in the Pacific with the use of bottom-pressure recorders (BPRs), which store data but do not report in real time; the systems were deployed for up to 15 months at water depths of up to 5 km and can detect 1-mm changes in sea level that last longer than 2 min. Frank Gonzalez (NOAA) discussed NOAA's plans (6) to deploy a six-buoy tsunami monitoring network of a real-time reporting version, for operational hazard assessment and warning (see figure). The first two buoys are scheduled for deployment in 1997, south of the Shumagin Islands in the Alaska-Aleutian SZ and west of the Cascadia SZ.

The installation of BPRs for real-time warning has also been progressing in Japan, where the National Research Institute for Earth Science and Disaster Prevention (NIED) has installed an optical submarine cable for earthquake and tsunami monitoring in Sagami Bay; S. I. Iwasaki (NIED) explained that its main objective is the inference of the sea-floor displacement for real-time warning.

Overall, despite significant advances over the past 5 years, the following issues remain troublesome, and progress is needed for reliable tsunami warnings. (i) There is lack of quantitative information on sediment layers overlying tsunamigenic faults and about how these layers affect directly the generation of tsunamis. (ii) A consistent methodology for differentiating between submarine slumping and tsunami-earthquake events needs to be developed. (iii) The distribution of friction in the fracture zone of tsunamigenic events needs to be better calculated either through measurement or theory. (iv) The effects of onshore small-scale topography and focus-inducing large-scale bathymetry and areas at risk from exceptional runup need to be further identified to allow for more targeted real-time warnings. (v) Better methods for identifying the strikewise and slipwise slip distribution need to be developed.

Yet, there is wide consensus that the seismic moment, the hypocentral location, and the dip and strike angles, if known from fault characteristics, are reliably determinable in the short term for first-order initialization of hydrodynamic computations and are sufficient for differentiating between small and large events, except in the Okal-style atypical events. The key for better data, better warnings, and faster results is the deployment of strategically located BPRs with redundancy built in and the use of satellite communications as soon as cost-effective.

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NOTA BENE: CANCER BIOLOGY

The Importance of Telomerase

The ends of chromosomes are capped with specialized sequences, generally multiples of TTAGGG. These nucleotides are synthesized by the ribonucleoprotein telomerase to complete the ends of the chromosomes during DNA replication, a task beyond the capacity of the usual DNA polymerase. Another, more glamorous function has also been ascribed to telomeres: Because many mammalian cells do not express telomerase, it has been suggested that the resulting telomere shortening during cell division eventually results in chromosome instability, causing the "aging" and death of the cell (*1*); the corollary to this notion is that the almost ubiquitous expression of telomerase in tumor cells may be a necessary contributor to the transformed phenotype, allowing the cells to go through round after round of division without losing their telomeres (*2*).

In a paper in a recent issue of *Cell* (*3*), researchers tested these functions of telomeres in mice by generating strains of animals lacking the RNA component of telomerase, which effectively eliminates any telomerase activity. Some of the features of these mice confirm the expected. Careful analysis of cultured fibroblasts from the transgenic mice by fluorescence in situ hybridization shows that about 4.8 kb of telomeric DNA is lost with each cell division and that there are a large number of chromosomal abnormalities. Nevertheless, for at least six generations, the mice survived.

What of telomeres and tumors? Fibroblasts from the mice missing telomerase are perfectly able to form tumors after transformation with oncogenes; this is true even for cells with profoundly shortened telomeres. Perhaps, like yeast, tumor cells have other ways of maintaining the ends of their chromosomes (*4*). This result takes some of the shine off the notion that telomerase is essential for tumorigenesis and, as the authors suggest, may indicate that telomerase activation is passively coselected as tumors develop.

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