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## How Science Can Save Lives

We know plenty about earthquakes, but we don't always apply the knowledge

BY KERRY SIEH

For the past decade, my Indonesian colleagues and I have been trying to understand great earthquakes in Sumatra. We had learned enough by last year to start teaching island villagers living on top of the region's giant earthquake fault about the threat. I will not know until I visit them soon whether our efforts saved any lives.

I am saddened but not surprised by our failure to apply what we had learned about earthquakes and tsunamis to warn the people living in Aceh or around the Bay of Bengal. We earth scientists are understanding slowly but surely that we have a role to play in the practical application of science to help lessen the suffering that nature can deliver. Fifty years ago we didn't know that earthquakes were caused by tectonic plate movement. Thirty years ago we didn't know how often big faults produced destructive earthquakes. Twenty years ago we didn't know that historically quiet megathrust faults, like the one that ruptured last week, were even capable of giant earthquakes. Fifteen years ago we didn't know there would be technology and science to enable the creation of a tsunami-warning system. So we are on a slow but steady track of exploring the science of earthquakes and tsunamis. The application of this knowledge to human welfare, however, is another matter. We have been slow to mitigate the hazards of earthquakes because in part we have been slow to make scientific discoveries, but we could easily accelerate the pace of discovery if our governments and our cultures encouraged young people to work in disciplines that advance an understanding of our environments.

We also do a poor job (to borrow Thomas Kuhn's phrase) in re-educating people's common sense. What Sri Lanka would have dreamed that giant waves could overwhelm her family and change her world forever? We scientists find it difficult to convince people that they should be worried about big, powerful geologic processes that may happen in their neighborhood tomorrow—or in 10 generations' time. It's hard to cajole people into worrying about what might happen a hundred years hence, when they have a tough job finding time to get their daily chores done. In poor countries, living is so hand-to-mouth that there is scant time to think about the distant future.

In July and August last year, people on the islands above the megathrust fault of western Sumatra were totally surprised to read in our posters and brochures that they might experience a devastating earthquake and tsunami. No one there had ever known of such things. But they listened when we told them that such events had occurred in 1797, 1833 and 1861. I am hopeful that when we revisit the islands, we will find those we spoke to alive, even if they are without homes or infrastructure. Hopefully, when the tsunami waves came, our friends took our advice and ran to high ground.

So what can my colleagues and I do now to apply what we're learning about Sumatran earthquakes and tsunamis? Should we expand our fledgling network of instruments to see how the part of the fault that ruptured on Dec. 26 "talks" to its neighbors and how its wounds will be healing over the next few decades? Might we learn something that will allow us to forecast more precisely the nature of the next large earthquake and tsunami? Whether or not forecasts become possible, could such an expanded effort be used to service an early-warning system? If we had been able and willing to set up a warning system just after the great Sumatran quakes of the 19th century, would we have had the persistence of vision to keep it running until last week?

Having long and well-founded visions of the future, based largely on what has happened in the past, could prevent much human suffering. Undoubtedly many hazards are currently being overlooked. (As a reporter blurted out to me in the press room at Caltech after the 1994 Northridge earthquake in Southern California: "Just how many unknown faults are there around here, anyway?") If we could pour the same financial and intellectual resources into places like Aceh and the Bay of Bengal as have gone to the U.S. or Japan, we could go a long way toward minimizing the effect of hazards worldwide.

One test of whether humanity acts differently in the next millennium is this: Can we marshal the visionary persistence needed to take charge of our future? Or will we carry on as we did throughout most of the past—simply reacting to tragedies as they happen? If the answer is the second, then there will continue to be more tragedies like that of last week.

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