that creates major earthquakes.

To the north of the recent Loma Prieta break, though, along the San Francisco Peninsula toward Menlo Park and downtown, things do not look so good. The San Andreas there has been locked tight since 1906, as had the Loma Prieta segment until last week. This Peninsula segment sweeps by Santa Clara, Palo Alto, Menlo Park, and San Mateo, to San Francisco's doorstep. Whether it will soon fail, too, or will wait a century or more to break as part of the next great earthquake is a question that is being debated. But even the most conservative observers are now giving the possibility of a second Loma Prieta–like earthquake a lot more thought.

"This [earthquake] clearly has increased the stress on the remaining 50 kilometers of the fault," says Wayne Thatcher of the USGS in Menlo Park. "The probability [of it rupturing] has certainly gone up."

Determining just what the probability is for another sizable San Andreas quake—this time closer to San Francisco—involves a calculation much like the one used to figure when a traveler will arrive at his destination. You have to know when he left, how fast he is moving, and the distance to the destination.

In the case of the San Andreas, the traveler is the crustal plate to the west of the fault, carrying northwestward with it Santa Cruz and the coast. Its speed past the rest of North America is 1 to 2 centimeters per year, on average. Unlike most travelers, globe-girdling plates move steadily while their edges that meet at a fault can snag and stick. Sticking edges only catch up with the plates during the moment of an earthquake, as the snag breaks and the edge snaps back. The last time the Peninsula segment moved was during the 1906 quake, so in a sense its next trip, the one that will end in its next rupture, began then. The third essential number, the length of the trip, is the distance that the sides of the fault slip past each other during a quake, which is a matter of some meters.

The recent Loma Prieta earthquake has done much to validate this approach to the long-term prediction of earthquakes, but, unfortunately, neither the amount of slip in 1906 nor the average slip rate on the Peninsula segment of the fault is well known. The uncertainties in such essential information were only too obvious in recent years as conflicting forecasts for the Loma Prieta segment appeared in print. In 1983, Lindh suggested that the 45 kilometers of fault north of San Juan Bautista had a 47% probability of failing during the next 30 years and creating a magnitude 6.5 quake. In 1985, Christopher Scholz of Columbia University's Lamont-Doherty Geological Observatory weighed in, predicting an equally probable 75-kilometer break. The next year Thatcher countered that Scholz's 75-kilometer segment had only a low probability of breaking. The debate hung on one uncertain number—how much slip occurred in 1906.

In the summer of 1988, the USGS working group sorted through the same conflicting data and used the same basic technique to reach a consensus about the probabilities of large quakes striking the San Andreas (*Science*, 22 July 1988, p. 413). For a 30-kilometer Loma Prieta segment, it found a 30% probability that it would generate a magnitude 6.5 shock during the next 30 years. That was one of the highest probabilities for any part of the San Andreas, but it was assigned one of the lowest levels of reliability.

Some of this uncertainty began to dispel this summer, at least for some researchers, when the second of two magnitude 5 shocks struck the San Andreas at the northern end of Lindh's forecasted rupture (*Science*, 18 August, p. 704). At the time, Lindh was quoted as saying: "Now we've had two of these magnitude 5's where we didn't have anything. I thought it was a dangerous segment before anything happened; I can only be reinforced in that feeling now."

"The earthquake Al Lindh forecast took place," says Thatcher. "It really was a vindi-

Bad Vibes at Stanford

Major corporate and academic research facilities in the San Francisco area survived last week's Loma Prieta earthquake in remarkably good shape. But buildings on Stanford University's main campus suffered up to $160-million worth of damage, according to a preliminary estimate issued by university president Donald Kennedy 3 days after the quake struck.

Stanford may have to foot the bill for the repairs itself. The university's earthquake insurance was canceled in 1985 when insurance companies pulled out of a lot of high-risk policies. The university subsequently established a special earthquake fund, but it contains only $3.5 million, says Robert Beth, director of risk management. Stanford is not alone: Beth says no California university currently has earthquake insurance.

The damage was confined mostly to older buildings, including two sandstone structures built in the late 19th century that were already closed for remodeling. Most newer buildings, including the Beckman Center, suffered just superficial damage, Beth says.

The quake also hurled fragile equipment and glassware from shelves and benches in many Stanford labs. But there was at least one saving grace—electric power was maintained, so cultures and other materials stored in freezers were preserved.

In contrast, the Berkeley and San Francisco campuses of the University of California suffered relatively minor structural damage. One telling indication: the Lawrence Berkeley Lab's synchrotron was up and running the day after the quake hit.

The Stanford Linear Accelerator Center (SLAC) also came through virtually unscathed, thanks in part to the fact that it sits on what is essentially a single granite slab. At worst, a few magnets may have to be realigned, says SLAC spokesman Michael Riordan. ■ Colin Norman

Stanford University

Quake debris. *A typical lab in the Stanford Medical Center.*