This Unstable Earth

"NO part of New Zealand is free from earthquakes. They have been felt in Kaitaia and in Stewart Island, at East Cape and Puysegur Point, in the bush and in the cities, on mountain tops and on the sea. Chimneys have fallen in Auckland, Wellington and Christchurch. Earthquakes were felt by Captain Cook, and by the Maoris before him. There were earthquakes last week; and next week there will be more."

These blunt words from a seismologist begin three talks on earthquakes which start in the Main National Programme next week. The seismologist is George Eiby, geophysicist at the Seismological Observatory of the D.S.I.R. in Wellington and author of a new popular book on earthquakes soon to be published in England and America. With earthquakes so much a part of our national life, listeners won't need to be urged to hear the story Mr. Eiby has to tell, and they will be as interested as we were to meet him and get a glimpse of the place where much of New Zealand's basic earthquake research begins.

When we called at the observatory the obvious starting point was a rotating paper-covered cylinder on which a glass pen was tracing lines. This is the visible recording seismograph acquired only a few months ago. The record for the past 24 hours which Mr. Eiby was about to remove showed that there had been one earthquake only a few hours before, and as it turned out the King Country was shaken quite severely next day.

One of the first points Mr. Eiby makes in his talks is that reliable seismographs have been in use for only a little over 50 years; and he explained to us that apart from a strong motion seismograph —so relatively insensitive that it had recorded only three or four shocks in the past 10 years or so—all the observatory's equipment till recently made a photographic record which could be looked at only once every 24 hours. The visible pen recorder is the new exception which makes it possible to calculate in about two minutes the distance from Wellington of an earthquake's epicentre and its magnitude. However, the final interpretation still depends upon the more accurate photographic records. Mr. Eiby explains in his second talk how the seismologist calculates his distance from a shock by measuring the time between the two main shock waves. This talk discusses at some length the interesting things the study of earthquakes has brought to light about the interior of our planet.

Like many other people, we imagine, we had supposed that a seismograph made a record to the extent that it was shaken bodily, and seeing a catch in this as the floor shook to our footsteps we put it to Mr. Eiby. His answer startled us. The recorder we were looking at, he assured us, was not at all interested in our footsteps. Its sensitive part was in the cellar below, and in fact its written record was ground movement magnified 3000 times. Another surprising fact is that instruments used for recording distant earthquakes have a lower magnification than those used for near ones.

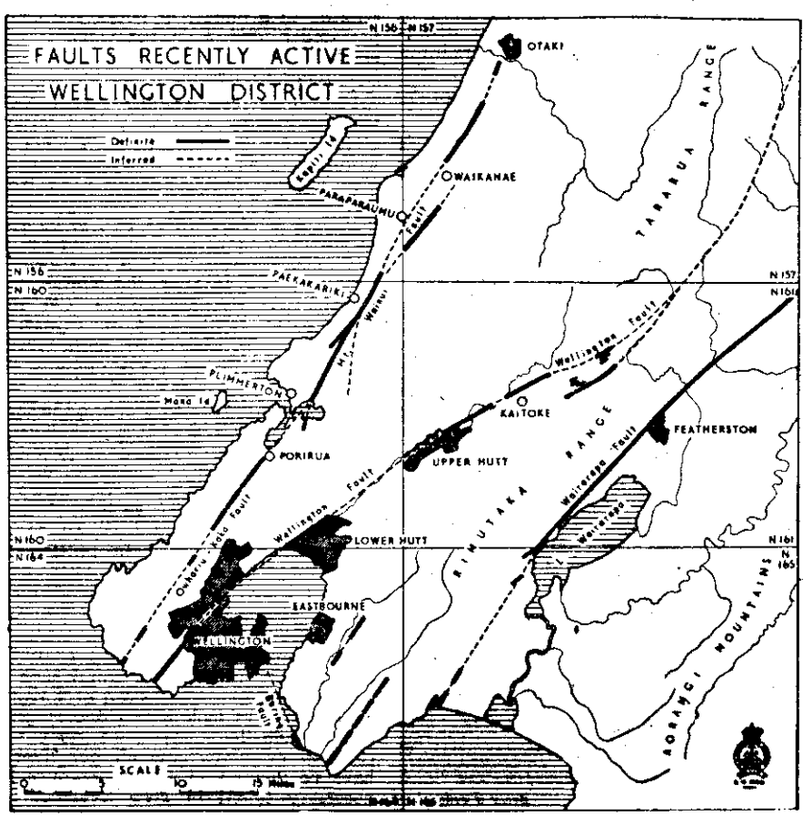
"You see, the ground is never still," Mr. Eiby explained. "Such things as human activity, waves beating on long stretches of coast and large weather disturbances set up tremors—microseisms, they're called—in the same way as earthquakes. Once the receiving instrument is sensitive enough to show this background there's no point in increasing the magnification. Seismographs have to be 'tuned in' to earthquakes at different distances. The amount of 'static,' or background, on the wavelength for picking up distant shocks is greater than at the local earthquake wavelength. And so we're able to use much higher magnifications for investigating local shakes than for distant ones."

In an outhouse at the observatory Mr. Eiby showed us the strong-motion recorder, which writes on smoked paper, and in the cellars below, lit only by a red light, we saw other instruments as well as the "sensitive part" of the visible recorder upstairs. Mr. Eiby explained that to get a complete record of everything that happens to the ground a seismographic unit should record six components—vertical movement and horizontal movement in two directions for near earthquakes and the same for distant ones. The equipment at Wellington falls short of this, but a new, modern seismograph in use at the observatory but soon to be installed in Samoa will eventually record all six components, and similar equipment to tell the full story has been taken to the Ross Sea by New Zealand scientists. Mr. Eiby said that there were also, of course, in many other parts of the country, seismographs whose records were sent to Wellington for interpretation. And New Zealand exchanges with countries all over the world the vital facts which are the raw material of earthquake research.

One of the most important things Mr. Eiby asks us to remember in his talks is that an earthquake is a return to a normal condition at the end of a period of accumulating strain on the earth's crust or somewhere beneath it. New Zealand, which is on the great earthquake belt encircling the Pacific Ocean, is marked extensively with faults like the one shown on the opposite page. Each of these represents a past earthquake. We don't know, says Mr. Eiby, whether the fault will ever move again, or how big a disturbance it will cause if it does. But we can be sure that earthquakes are going to continue.

Because they will continue, Mr. Eiby believes we should all take precautions to live alongside them; and before we left him he had a word with us, as he does with listeners in his talks, about some of the simpler ways in which we can help to protect ourselves. Few buildings collapse completely even in the largest earthquakes, he said, so we are much safer inside so long as we don't get hit by anything falling. In a country like ours it's commonsense to see that we don't store on top shelves heavy things that will fall on us; and heavy furniture should be fixed—a nail or two will do—so that it won't shift or topple over. If you *are* involved in a major shake, you should get under a table, or into a doorway where there's a beam to keep off any heavy things that fall. *Don't* rush outside, where the chimney, the roof tiles or even the whole of a brick wall may fall on you "Some people don't seem to learn, you know," Mr. Eiby added. "One of our men was on hand a few hours after a sizeable South Island shake a few years ago and found a storekeeper already replacing the pyramids of goods that had come down. And he went on doing this, even though for about three weeks afterwards there was a strong after-shock to bring them down again about every other day."

Mr. Eiby's talks, which will be heard from YA stations, 3YZ and 4YZ at 1.30 p.m. on Sundays, starting on March 17, first explain why earthquakes happen, and why New Zealand is singled out for "shock treatment" when some other countries get away almost without it. After discussing in his second talk how scientists have been able to turn them from a liability into an advantage, he goes on to consider some practical applications of their discoveries, and to note the disadvantages of living with earthquakes and how they can best be faced.



LEFT: This map, prepared by the D.S.I.R. Geological Survey, shows faults recently active in the Wellington district. BELOW: George Eiby with the new visible record seismograph *N.Z.P.S. photograph*