

## Superstition or electromagnetic phenomena?

Many people think that earthquake precursors are superstitions or inventions. One of the reasons for this is that precursor phenomena are not being investigated scientifically because such research falls between scientific disciplines and researchers are reluctant to undertake research outside their specialties.

I believe earthquake precursor phenomena are protoscientific, that is, still scientifically unproven. But my many experiments strongly support a scientific basis. If we accept the theory that precursor phenomena are generated by electric fields produced on the ground by huge underground stresses then it is possible to reproduce these effects in the laboratory by exposing animals, plants and electronic objects to electric fields.

Here are more laboratory experiments reproducing reported earthquake precursor phenomena.

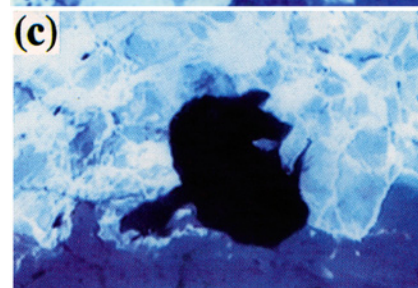
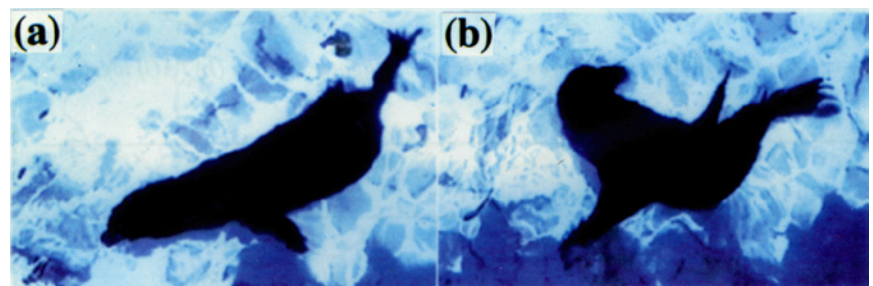
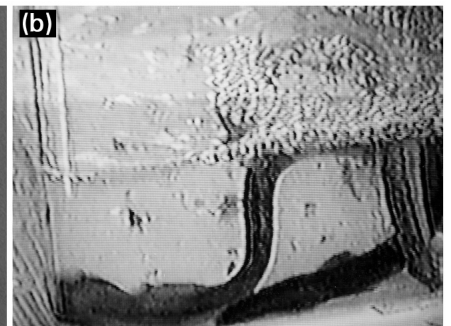
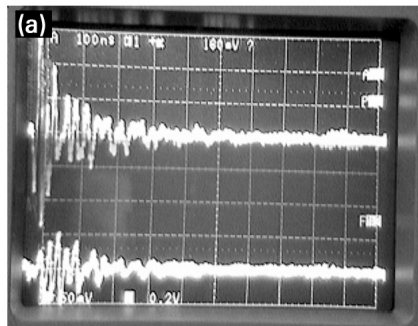
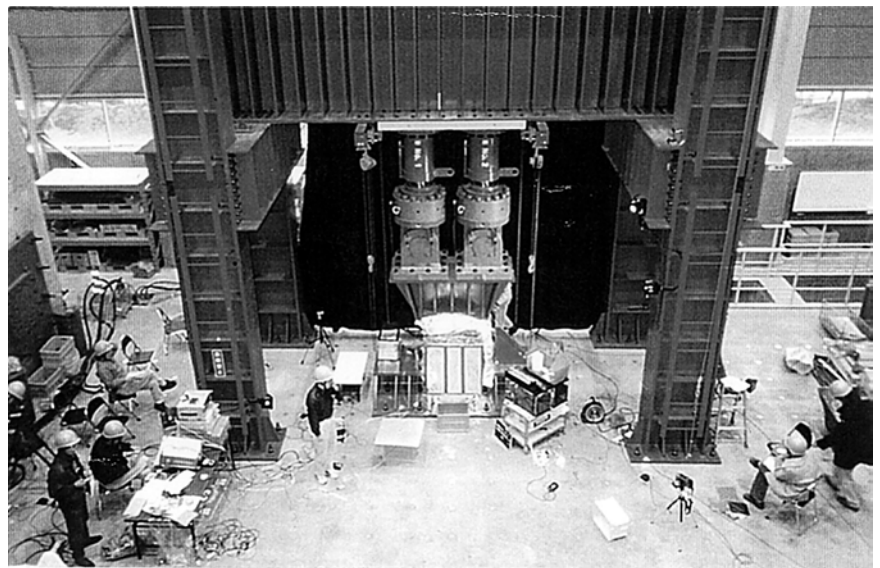
[Candle flames](#) | [disruption of magnetic fields](#) | [behavior of chickens](#)

In physics there are several explanations for generation of EM fields before earthquakes: the piezoelectric effect, the streaming potential of water and natural fuel cells. The first two are described in greater depth in *Earthquakes and Animals* (see Homepage.)

To test my theory I carried out three kinds of experiments.

**1.) Rock compression experiments.** These generated EM fields in which behaviors of adjacent laboratory animals were recorded. Top: the 1000-ton compression equipment used for the rock crushing experiments. Unusual behaviour and EM pulses were observed. Right: (a) Oscilloscope display of detected EMwaves, (b) simultaneous eel activity.

**2.) Electric field experiments** using metal electrodes in which aquatic animals such as laboratory catfish, crocodiles and sea lions became disturbed and excited. The sensitivity of marine mammals to electric fields is seen in the behaviour of the sea lion in the bottom photo. In (a) it is swimming normally, in (b) it notices a weak electric pulse, in (c) it turns away from the pulse, in (d) it avoids the electric field.



**3.) High-voltage experiments** using Van de Graaf and Wimshurst generators, in which the [second hands of clocks](#) rotated rapidly, a candle flame bent and a sensitive [mimosa plant](#) closed its leaves and bowed its stems.

In my view these experiments show that reported precursor phenomena are not just fables but do have a scientific basis.

As our use of electronic appliances and devices increases so there are increasing numbers of reports of malfunctioning electronic objects before earthquakes, from mobile phones to quartz clocks, car navigation systems, car windows, and refrigerators. We reproduced some of these in electric field experiments in the laboratory. Radio interference before earthquakes is commonly reported and there was an account of distorted TV images the night before the Kobe earthquake, which we replicated in the laboratory. These may well be caused by earthquake related EM fields.

### **Can animals be used in earthquake prediction?**

I think they do have something to say to us. The normally stationary catfish, biologically highly tuned to pick up electric fields generated by moving prey goes into a frenzy in strong electric fields. Such fields produced before earthquakes will create the same reactions. If there are no approaching thunderstorms and the household cat is continually washing her face, then it may be responding to pre-earthquake EM fields. Because our laboratory tests showed many animals were irritated by electric fields and behaved anxiously, the animals in the children's book make a fuss when they feel pre-earthquake electricity. Maybe they do think some sort of monster is coming. Careful observation of the behavior of a range of animals and the erratic performance of a range electronic gadgets and appliances should have predictive value, or at least remind us to stay prepared.

### **Are earthquakes unpredictable in principle?**

Some critics of earthquake prediction say that true prediction must give accurate magnitudes, dates and times, but that such predictions are impossible in principle because rock fracture is too complicated a system to yield this information.

I argue that earthquakes are not opaquely complex systems. I believe they are caused by fault movements. Theoretically it is possible to predict an earthquake if we observe a massive micro-fracture (real-time destruction of rocks) through well-spread EM field detection. If we can gather sufficiently wide-spread precursor observation data we should be able to calculate a good enough time-frame (within a few weeks), general location and possible magnitude to sound a warning before the earthquake occurs. This is a similar principle to the warning system used in the aviation industry: piezoelectric elements transform sound vibrations from structural microfractures into electric signals that warn engineers that it's time to replace aging parts.

Only God can predict the future. Humans make mistakes no matter how hard they try. But we should still make every effort. Those who say earthquakes cannot be predicted stifle creative thinking and research and create negative attitudes. Progress stops.

The Kobe Earthquake killed 6434 people in 1995. An inland earthquake of the same scale in Tokyo would kill an estimated 7,200 and injure 140,000 people. In the great Kanto earthquake of 1923, 140,000 people were either killed or went missing. According to some estimates the next big one could claim 150,000 lives and cause 120 trillion yen of damage.

### **Notice unusual animal behavior and be prepared**

We cannot stop earthquakes but we can be prepared for them. I really hope that children who love animals will get into the habit of watching their behavior. If there is no other explanation for it (e.g. an approaching typhoon or thunderstorm or adjacent large electric motors), it may mean an earthquake is coming.

A list of precursor phenomena is shown in [Tables 1-5](#). The data seem to point to observable EM precursors about two weeks before a quake, a lull, then a sudden increase about one day before the quake. If there is no earthquake we can simply be grateful.

Here are measures that will reduce injury and damage if you think an earthquake might be imminent.

- Fasten furniture to the wall or floor
- Clear the top of the chest of drawers and don't sleep near it.
- Keep a good stock of drinking water and food.
- Fill the bathtub with water.
- In a wooden building sleep upstairs.
- Turn off the circuit breaker and the gas tap when an earthquake occurs.
- Plan your evacuation route in advance.

### **Take this research seriously.**

Years ago I began work on a dating method called Electron Spin Resonance (ESR) based on accumulated unpaired electron spins produced by natural radiation in many materials, including gouge in geological faults. Initial scientific reaction was negative, and I was told that electrons cannot remain unpaired for hundreds of thousands of years. However I wrote my findings up in English and published them. Now ESR dating is used all over the world.

I have had the same response to my earthquake precursor research. One seismologist told me that observation of pre-earthquake phenomena might reduce fatalities by about 34 people out of 6434 in a quake as large as that of Kobe but that only government measures would make a significant difference. I concluded that 34 lives were worth saving and continued my research.

The Kansai Research Foundation and the Osaka University Frontier Research Centre supported our research. TV channels also gave coverage to our experiments. As a researcher who has worked in an interdisciplinary field somewhere between solid state physics, geology and anthropology I am pleased to have helped provide a bridge between culture and science by explaining ancient earthquake legends scientifically and helping give birth to the field of electromagnetic seismology.

My grateful thanks to the members of my laboratory for their co-operation, to my collaborators, the members of the Kansai Science Forum and the general public who gave me information and encouraged me to write this book.



Motoji Ikeya (2005)