Earthquakes and Seismographs

(Continued from page 3.)

an onion. There is good evidence that the outer layer is about 30 miles thick and the basement rock is composed mostly of granite. There seems to be a well-defined surface of discontinuity (i.e., a break of rock type) around this depth. Then the next thick layer seems to have a break at about 1500 miles below the earth's surface. The nature of the rocks in this stratum is thought to be darker and heavier than that in the upper and something like basalt rocks.

Some authorities consider that minor breaks also exist at 75, 250, 750 and 1100 miles below the surface, but it is a fairly well agreed fact among seismologists that the main breaks or junctions of layers occur at 30 and 1500 miles below the surface. Regarding the central core, the evidence available indicates that it must be homogeneous to a high degree, very rigid and dense—more dense probably than steel. Both temperature and pressure existing there must be of a high order, but the state of balance of these forces is not quite understood.

Now in order to get a better idea of the propagation of the earth waves, if we look at the clock and imagine it represents a section through the earth with New Zealand represented by the figure 7 and say the vibrations of the Napier 'quake would pass around the earth's outer layers in the direction of 8, 9, 10, etc., i.e., in a clockwise direction, and simultaneously there would be a series of waves passing around in a counter-clockwise direction. A further series of waves would be found to be passing through the earth close to the inner core.

Yet another type of wave has to be accounted for. This is called the ground wave, and comes in after the transverse and longitudinal waves because it is composed of the energy of these waves that have been reflected from the various layers and further reflected from the floor of the ocean on the air itself. It travels right around the outer ground-level skin, and is the strongest of all the waves.

Thus when all these incoming waves arrive in close succession, we have an explanation of the complex curve recorded.

Actually the complete motion of a particle of matter was carefully analysed in a Japanese earthquake, and subseqently a model was made which proved to be like a huge loosely-tangled knot of yards of string.

In spite of the fact that the curve record is very complex, seismologists can interpret the irregularities very accurately. To give just one instance that happened immediately after the Murchison 'quake, it may be recalled that an observatory in Ottawa, Canada, announced that a 'quake must have taken place at the latitude and longitude of Murchison and calculated the time to be only one minute later than it occurred.

Seismographs.

THE seismograph itself is very sensitive owing to the mechanical arrangements for magnifying the actual movements that it detects. The record is made by either a beam of light focussed on to a slowly-moving photographic paper or a solid stylus scratching its motions on a smoked paper disc or cylinder.

Two arms set at right angles are oriented in a north-south and east-west direction to record the relative amount of motion in each plane.

A central mass, consisting of a heavy weight, ranging even up to tons, is delicately pivoted or suspended, and upon it is attached the recording arms or mirrors in the case of a beam of light.

What takes place when an earthwave comes along is that the supports move and the central mass remains more or less fixed because of the principle of inertia on which the instrument is built. Thus we see that the actual motion is recorded by and on the supporting or balancing outer framework.

Another type of seismograph that is very sensitive is one that uses a radio circuit to give it the required accuracy.

The fundamental principle on which this instrument is constructed is that a cylindrical mass several hundred pounds in weight is suspended by a wire 80 feet long, and has a large plate of a condenser fixed at the bottom. Another condenser plate is held a little distance away and is connected into the circuit. Any variation in the distance betwen the two plates sets up audio frequency sounds, which are ultimately converted into a series of waves on a recording device.

The Science of Seismology.

SEISMOLOGY is a fairly new science, but seismographs, of a type, were used by the Chinese hundreds of years ago. Much has already been accomplished, as mentioned earlier, but many problems still remain to be solved. There is the question of "continental drift," by which is meant the view held by some authorities that the continents themselves are more or less afloat on the lower layers of the earth, much the same as waterlogged pieces of wood. It has been stated that there is a measurable amount of lateral motion across the earth's crust by the North American Continent within the lifetime of an average man.

Seismology, aided by geology, has indicated where mountain chains may be borne where there are now deep seas.

Men of all nations have taken up the study, but the Japanese have led the way, aided by the fact that they experience thousands of earthquakes every year. The late Professor Omari was no doubt one of the greatest authorities on this subject.

It was he who warned the Japanese authorities of the likelihood of impending earth movements in certain areas of structural weaknesses; and in view of this warning the majority of the population were evacuated to other regions. Subsequently earthquakes did take place in the locality, but the toll of life was considerably lesser than it would have been had his warning gone unheeded.

Future Earth Movements.

THE question naturally arises as to whether earthquakes can be predicted, to which I answer "Yes, provided a geological time scale is used."

Man, with his average span of three score years and ten on this earth of ours fails to comprehend the true age of the earth, which is of the order of 1,500,000,000 years.

On geological evidence, earthquakes may continue in a region for a long period. New Zealand, in particular, must look to that narrow rift in the sea floor which runs from the vicinity of the East Cape over a thousand miles to Tonga, as the evidence of crustal weakness and cause of many of her earthquakes.

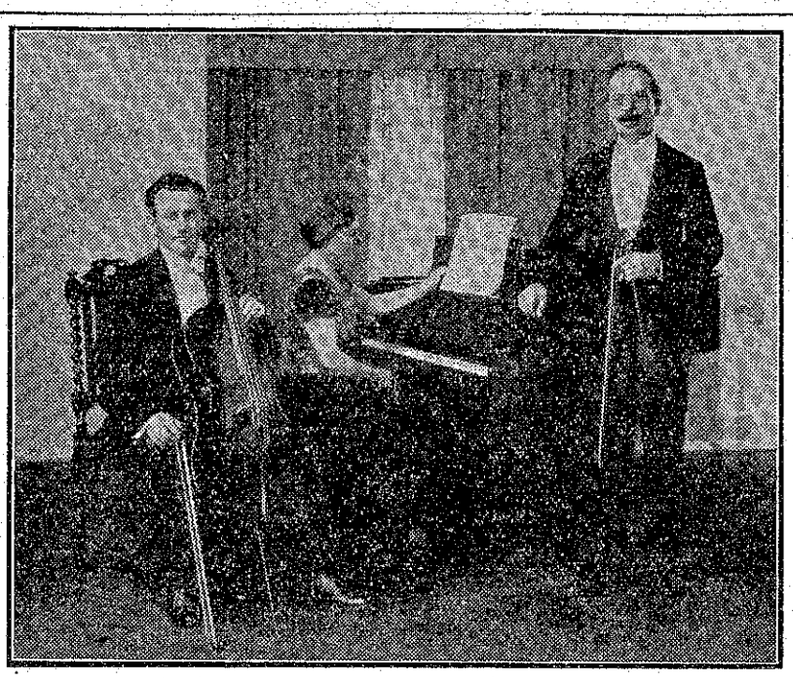
The study of the mountain systems of the New Zealand-New Guinea areas and elsewhere right around the whole Pacific by scientists of all nationalities, will, in due course, enable us to have greater warning, and therefore preparedness for future earthquakes that undoubtedly will come in the course of history.

I will conclude by quoting the following remarks of Professor Bartrum, of Auckland University, with which I heartily agree:—

"We in New Zealand are living in a fool's paradise, in that we are making no adequate attempt to study earthquakes and their causes.

"New Zealand is known to be liable to earthquakes of varying intensities, and there is no reason to suppose that the islands have yet reached a stable state. There is a yearly average of about 70 earthquakes strong enough to be felt by humans. At the same time little real attention is paid by the Government to the study of seismology, and I would urge on all to attempt to have this state of affairs remedied."

In the course of this lecture to the Justices of the Peace Association, Professor Bartrum pointed out that very frequently warnings of a severe earthquake were given some time before it occurred, in the form of strange noises of a very low wave length, which might be heard by some people and be inaudible to othes. The cause of these noises was a series of small earth jars, brought about by the breaking of uneven conditions between planes of rock, which would eventually slip extensively and cause the big earthquake.



A TRIO FROM THE WELLINGTON CHAMBER MUSIC PLAYERS.
A trio of Wellington's leading artists who recently performed at 2YA. From left to right: Claude Tanner ('cellist), Evelyn De Mauny (pianist), and Leon De Mauny (violinist).
—Jauncey, photo.

AS announced in our last issue, Mr. Will Lawson, the much-travelled New Zealand poet and writer, will, on May 22, speak from 2YA on "Impressions of the Far East." The time of this talk has been altered, however, from 7.40 p.m. to 3.15 p.m.