PHYSICS

Gravity Wave Detector

A further proof of Einstein's general theory of relativity may be obtained when a new device to detect gravity waves is completed and in operation.

➤ A DEVICE to detect gravity waves, believed to be the first of its kind, will be built and operating within two years at the University of Maryland.

Dr. Joseph Weber of the University told the American Association for the Advancement of Science meeting in Washington the device is designed to measure the extremely weak effect of gravity waves when they strike an object.

The existence of gravity waves is predicted by Einstein's general theory of relativity. Any mass that is accelerated generates gravity waves. However, no one has even seen or detected them, Dr. Weber told SCIENCE SERVICE.

If a gravitational wave as strong as the earth's magnetic field hit the earth, you would be lifted from your seat and buildings from their foundations. Since this has not happened, gravity waves must be extremely weak.

Dr. Weber's report reflected a renewed interest in gravitational theory now developing after many years of neglect due to the lack of experimental guideposts and mathematical difficulties. Both remain troublesome, but much progress has been made toward better understanding of general relativity by considering approximate solutions of the very difficult equations.

One approach being thoroughly studied is the "quantization" of general relativity. This involves treating gravitational radiation as consisting of tiny packets, not as being continuous. This can be likened to the situation with light, which many years ago was thought continuous radiation but is now known to consist of tiny light packets, or photons.

The packet of gravitational energy is the graviton. Unlike light, which will interact only with charged particles, gravitons can interact with neutral particles.

Dr. Weber's device to detect gravity waves is based on the small effect they are predicted to have on a relatively large mass. When the gravity wave penetrates the mass, it is jiggled. This jiggling motion can be converted by piezoelectric crystals and low noise amplifiers into an electrical output in the radio wave range.

To eliminate unwanted effects, Dr. Weber plans to place two masses, each in its own conducting box, then combine their outputs. He said a superconductor such as lead cooled to a temperature near absolute zero, some 459 degerees below zero Fahrenheit, would give a virtually perfect electrical shield.

Whether it will take one hour, a day or a lifetime to detect gravity waves, Dr. Weber cannot predict, since this is an effect not previously studied.

Dr. Weber said that at a frequency of 100 kilocycles, he expected to be able to find any radiation having an energy of a millionth of an erg over a square centimeter per second per cycle. Today's techniques are sufficient to do this, and the detecting equipment for gravity waves would be considerably less sensitive than the radio telescopes used to pick up faint radio waves from heavenly sources.

He hopes his equipment will give a number that is the upper limit of the gravitational energy impinging on the earth.

Successful detection of gravity waves would be another proof of Einstein's general theory of relativity. So far there are only three known verifications.

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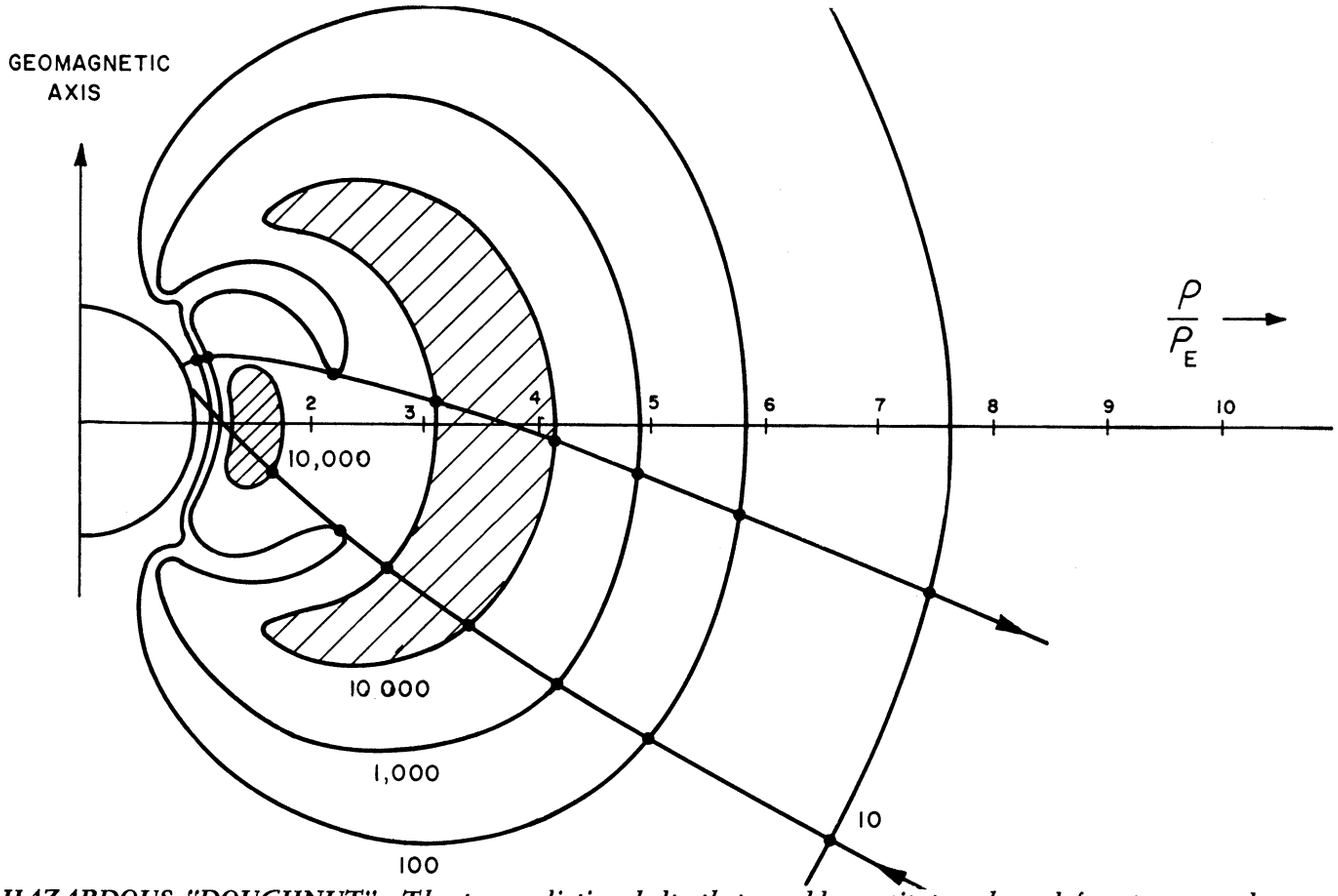

HAZARDOUS "DOUGHNUT"—The two radiation belts that would constitute a hazard for space travelers are shown. *(See. p. 21)*