

## GEOPHYSICS

# Earth's Core May Be Solid, With Hydrogen Dissolved

## Study of Earthquake and Experiments With Metals Lead to Conclusion Center Is Metal Occluding Gas

**M**EMBERS of the clergy have long been considered authorities on the state of things below. However, their ideas of brimstone generally had no experimental data to support them.

Newest theory of the nature of the world's core comes from a Jesuit priest, Father Joseph Lynch, of Fordham University. As a physicist and director of the University's Seismograph Observatory, he has accumulated actual laboratory evidence in favor of his concept.

According to Father Lynch, the earth's core is metal in which hydrogen gas is dissolved. Such a solid solution is not as familiar as the usual liquid solution, of salt in water, for instance.

A large amount of knowledge of the inside of the earth has come from study of the travel of various kinds of waves from earthquakes. These are of two kinds. Some are longitudinal or compressional waves, in which the earth particles move forward and backward, in the same line as that in which the wave is going. Sound waves are of this type. The other kind are transverse, or "shear", waves. In these, which travel more slowly, the particles move from side to side. These are more like the waves set up by waving a long string.

The shear waves can only travel through a material that has a certain amount of rigidity, in other words, a solid. Liquids have no rigidity, and hence only the compressional waves go through them. They travel through solids also.

Earthquake experts have found both compressional and shear waves reaching recording instruments through the globe from distant tremors. From their behavior, they have learned that there is a definite core to the earth. About half its diameter—some 4,000 miles.

The compressional waves that enter this core reappear on the other side and travel to their destination, but shear waves that enter it seem to be lost. Hence, it has been supposed that this core is a liquid, an idea supported by a study of the effect of tides, which indicates that the earth's center cannot be very rigid.

In a paper issued by the Seismological

Society of America, Father Lynch calls attention to the fact that some evidence has been found that shear waves do reappear, though in greatly reduced form, after penetrating the core. This, he says, shows that the core has some rigidity and cannot be a liquid.

He performed experiments with the metal palladium, which is similar to platinum, and dissolves hydrogen readily. Its rigidity, he finds, is greatly reduced as more and more of the gas is absorbed, or occluded, as the process is called.

In his experiments he was unable to make the palladium occlude enough hydrogen to make it as slightly rigid as it would theoretically have to be in the

interior of the earth. However, he stated:

"In the core of the earth the enormous pressure would prevent such escape, and hence it is plausible to imagine a metallic core occluding an amount of hydrogen sufficient to reduce the core's rigidity practically to zero. On the basis of the present work, therefore, a solid solution is proposed as representing the state of the earth's core.

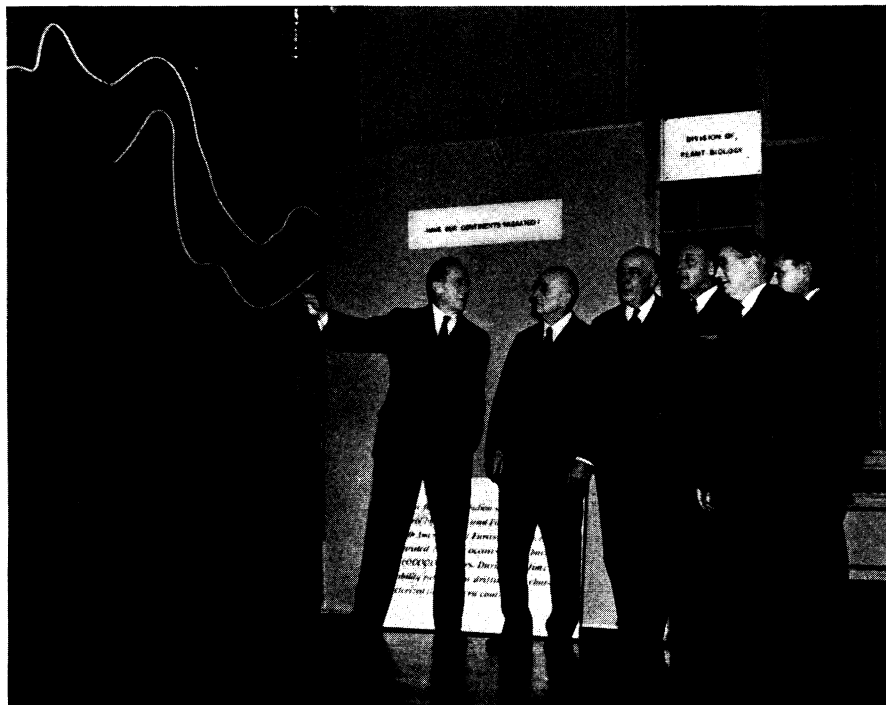
"The gas presumably would be hydrogen; the metal one of the many metals known to occlude hydrogen readily. Such a solid-solution core would have the advantage over a liquid core that it would permit feeble shear waves to pass through, as seismic investigations seem to require. It would have the advantage over a solid core that it would have the low rigidity demanded by tidal action."

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## MEDICINE

## Doctors Warned to Watch For Pneumonia-Like Disease

**A** NEW respiratory infection, a pneumonia-like disease which cannot be fought with sulfapyridine chemical so



### CONTINENTAL DRIFT

*Prof. Ralph W. Chaney, of the Carnegie Institution of Washington staff, is explaining new evidence against the theory of moving continents at the Institution's annual exhibit. To the right of Prof. Chaney are Trustees W. Cameron Forbes, Frederic A. Delano, James W. Wadsworth, and Roswell Miller. Dr. Vannevar Bush, president of the Carnegie Institution, stands in the foreground at the right. This exhibit was prepared with the cooperation of the Museum of Science and Industry of New York, where it will soon be displayed.*

effective in curing ordinary pneumococcus pneumonia, is the subject for comment by the *Journal of the American Medical Association* (Dec. 21).

Because of sporadic cases and minor epidemics that have occurred in this country and abroad, the doctors of the nation through this comment are being warned to watch for this disease which has already acquired a whole series of labels. The term "acute pneumonitis" is used in the report.

Unlike ordinary pneumonias, the cause of this new disease is believed to be a virus, rather than a germ. Dr. J. M. Weir and Dr. F. L. Horsfall, Jr., of the Rockefeller Foundation, have succeeded in transmitting the disease to the wild mongoose, abundant in Jamaica. The virus was also recovered from the ill mon-

gooses and its guilts as the cause of the infection established by being again used to cause the disease. The mongoose was used as an experimental animal because of its resemblance to the ferret and because it can easily be obtained.

Because it resembles epidemic influenza in many respects, the new disease is of peculiar interest just now when influenza has been epidemic in some places in this country.

One striking feature of the disease is that it has a long incubation period, developing about two weeks after infection. The onset is accompanied by high fever, headache, sweating, rasping cough, little involvement of the lungs that shows up in X-rays, and the infrequency of chill or pain in the chest. Most cases are mild.

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some cases of gingivitis and pyorrhea," Dr. Stephan reports.

Long-term studies of patients with caries and other dental diseases are now under way. In some cases carbamide is being used as a dentrifice. Carbamide would be ineffective, however, unless there was some urease to convert it to ammonium carbonate, and not all persons may have enough of the urease-containing bacteria in their mouths to do this job effectively. So in some of the test patients, the mouth is being inoculated with harmless bacteria which contain urease. In still others, the two, the bacteria and carbamide, are being used together.

These are the tests which are expected to shed new light on the cause of tooth decay and its prevention.

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## DENTISTRY

## Discovery Gives Promise Of Dental Decay Prevention

### Rinsing Mouth With Carbamide Solution Not Only Protects From Acid But Adds Calcium to the Teeth

**C**ARBAMIDE, a common chemical known also as urea and produced in the body from proteins as well as in the laboratory, may provide the weapon for eventual conquest of tooth decay or dental caries. It may itself become this weapon and is now being tested for its caries-preventing possibilities.

Discovery that carbamide can play a role in protecting teeth against decay was made by Dr. Robert M. Stephan, of the University of Illinois College of Dentistry. (*Science*, Dec. 20.)

"These studies promise to shed new light on the causation and prevention of caries and to furnish a new treatment for gingival (gum) and periodontal diseases," Dr. Stephan declares.

Carbamide's tooth-protecting ability depends on the fact that under the action of an enzyme called urease it is converted to ammonium carbonate. The latter is able to neutralize some of the acids which might otherwise produce caries activity.

Rinsing the mouth with a solution of carbamide (synthetic urea) has been found to change the condition of bacterial material on tooth surfaces and in cavities to a more than normal degree of alkalinity. At this degree of alkalinity, calcium phosphate tends to be deposited

on the tooth from the saliva instead of being dissolved from the tooth. In other words, the teeth are not only protected from acids which take calcium out of them but are given additional amounts of tooth-building calcium, at least on their surfaces, if not within their structure.

The enzyme needed to convert carbamide to ammonium carbonate is contained in certain bacteria, such as *Staphylococcus albus* and *aureus*, which grow on the tooth surface in the bacterial plaque. These plaques also contain bacteria which have the power to ferment starches and sugars to acids which decalcify teeth and thus cause decay.

Previously it has been thought that the saliva neutralized the acid in these plaques by means of its buffers, substances which tend to lessen the effects of acidifying or alkalinizing materials. Now Dr. Stephan has discovered that in addition to the buffers contained in saliva, its urea is converted by the action of certain urease-containing bacteria to the acid-neutralizing ammonium carbonate.

"Solutions of carbamide, used in conjunction with a toothbrush, have been found to be effective in cleaning teeth, and clinical observations have indicated that the treatment may be of value in

## ASTRONOMY

## Astronomers Find Hydrogen Gas in Cunningham Comet

**H**YDROGEN gas, never before recognized in a comet, has been discovered in Cunningham's comet, now visible in the western evening sky. This discovery, which radically changes the ideas of astronomers about the nature of comets, was announced here at the Harvard College Observatory, where the comet was discovered in September.

Up to now, carbon, oxygen, nitrogen and sodium have been the principal elements recognized in comets by analyses of their light. Except for the sodium, these have always been in compounds, such as carbon monoxide.

Studying one spectrum plate of the new comet, Leland E. Cunningham, discoverer of the comet, and his colleague, Dr. Fletcher G. Watson, have found dark bands that seem to show that a comet consists mostly of hydrogen.

Similar dark bands have been found in comet spectrum photographs before, though they have never been interpreted as due to hydrogen in the comet itself. It is planned to re-examine these old plates as soon as possible. With further exposures that may be made of the new comet, these may confirm the presence of hydrogen.

If it proves correct, the new discovery, said the Harvard astronomers, will be important in the interpretation of future comets. Any new clue to their birth will contribute to understanding better one of astronomy's major unsolved puzzles, the origin and evolution of the solar system.

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