to fit within a 20-gauge spinal needle. A lock is placed on the inner needle which holds it in place, making the two needles integral. The point of the inner needle and the tip of the outer needle are carefully ground to present the smoothest contour possible in an attempt to avoid any abrupt discontinuity which might render the passage of the needle point jerky. When the tip of the inner needle pierces the arterial wall, blood will flow from the butt. The needle is then advanced slightly to insure that the outer needle is also within the arterial wall. This may be verified by detaching the inner needle by operation of the lock and withdrawing slightly. If blood flows freely from the inner needle, the tip of the outer one is usually well within the lining of the vessel. The inner needle is then removed and a cone-shaped introducer slipped over the rearward projecting shaft of the outer needle. This introducer is then used to permit the easy insertion of the stilette into the outer needle. The point of the stilette is ground with the aim of converting the tip of the outer needle into a rounded surface. Once the stilette is in situ, the outer needle can be advanced one-half to one inch up the artery and the needle strapped into place on the wrist with adhesive tape.

In order to obtain blood during the ensuing one to two hours it is necessary only to remove the stilette and introducer, placing them in hydrogen peroxide, and place a Luer syringe in situ. If blood is not flowing freely, reintroduction of the peroxide-wet stilette will usually clear the needle, especially when combined with slight suction on the syringe. On completion of sampling, the introducer is replaced, and the stilette can then be slipped into place without trouble. In the absence of the introducer, considerable difficulty was experienced in inserting the stilette into the shaft of the outer needle in the face of the stream of blood issuing from it. The introducer was devised to overcome this obstacle which becomes a serious one when dexterity is poor, as during a pressure-breathing experiment at altitude.

The needles developed so far have been successfully implanted in more than 70 per cent of all attempted punctures by the three persons who have employed them. It is thought that with improved dexterity and modifications in technique the percentage of failures could be further reduced. The needle permits free use of the hand in spite of its presence at the wrist. The procedure for sampling is so simple when using the implant that blood can be obtained by the subject himself if necessary.

Although originally developed for use in high-altitude physiology, it is to be noted that this technique may be applied to the study of arterial blood pressure by the use of a suitable pressure-recording device (*2*). In these laboratories a "strain gauge" pressure recorder developed in collaboration with the Statham Laboratories, Los Angeles, has been used for this purpose.

References

1. COURNAND, A., RILEY, R. L., BREED, E. S., BALDWIN, E. DE F., and RICHARDS, D. W. *J. clin. Invest.*, 1945, **24**, 106.
2. GARDNER, E., and CRESCITELLI, F. *Science*, 1945, **102**, 452.

Letters to the Editor

Origin of Microseisms

Since it is now reasonably certain from the work of Ramirez (Ph.D. Dissertation, Saint Louis University, 1939; *Bull. seismol. Soc. Amer.*, 1940, **30**, 35–84, 103–178) and Gilmore (*Bull. seismol. Soc. Amer.*, 1946, **36**, No. 2) that group microseisms, as defined by Gherzi in his various publications, originate in the ocean bottom under the center of each hurricane, typhoon, or extratropical cyclone, a satisfactory explanation is needed for the mechanics of their production.

At a conference on storms and the origin of microseisms held early last January at the U. S. Coast and Geodetic Survey in Washington and at the meeting of the American Meteorological Society in St. Louis, 29 March 1946, the writer suggested a possible mechanism which would seem to give the right order of magnitude for the quantities involved.

While quantitative data on the conditions in the interior of a hurricane are sparse and difficult to obtain, we have at our disposal some fairly reliable qualitative information.

In the first place, a hurricane is an air vortex which exerts a frictional torque on the water surface. The air-water friction is considerable; in fact, the observed values of such friction seem to be greater than would be expected from simple theory. Consequently, we must expect a water vortex to be generated. A vortex motion, once generated in the water, must extend to the sea bottom, since, as is well known, a vortex in a nearly perfect fluid cannot begin or end within the fluid. It must either form a closed vortex ring or begin and end at boundaries, such as the free air surface and the sea bottom in the case of the ocean. Observations seem to indicate considerable convergence and consequent piling up of the surface water in excess of the doming to be expected from the lowered air pressure. There is no way for the excess water to escape except downward, and this piled-up sea water is lighter than normal.

There are three factors which affect the density of sea water: the temperature, the pressure, and especially the salinity. In the interior of a hurricane, typhoon, or extratropical cyclone, the pressure is lower and the temperature is higher than in the surroundings. Hence, the surface water expands, and the density is less. Furthermore, there is heavy precipitation, so that the salinity is lessened and the density decreased. Therefore, the piled-up lighter surface waters, escaping downward through the core of the water vortex, penetrate into the heavier water at depth. Buoyancy will come into play. The downward-plunging lighter water will be stopped and forced back upward by the surrounding heavier water, and thus vertical oscillation of the vortex will begin. Since the vortex, as stated, must extend to the sea bottom, the vortex oscillator will deliver to the ocean bed a series of blows which will set the ground vibrating and cause it to radiate elastic waves. A hurricane may have a horizontal diameter of 200–300 miles, and an extratropical cyclone may cover a much greater area. Hence, the mass of water in motion is great, and its vibratory momentum will be ample to account for the observed energy of the microseisms.

Let the linear vector velocity of a small portion of the water be $\mathbf{q}$. Let ρ be the density, and let $\frac{D}{Dt}$ be the Stokes operator. Then the Eulerian equation of motion of the water will be $\frac{D\mathbf{q}}{Dt} = \frac{\partial \mathbf{q}}{\partial t} + \mathbf{q} \cdot \nabla \mathbf{q}$, and the equation of continuity, $\frac{\partial \rho}{\partial t} + \rho \operatorname{div} \mathbf{q} + \mathbf{q} \cdot \nabla \rho = 0$.

To simplify the discussion, let us assume a columnar vortex, in which the angular velocity ω is the same for all parts and $\frac{D\omega}{Dt} = \omega \cdot \nabla \mathbf{q}$, and a region outside this core, in which the curl vanishes, the motion depending on a velocity potential ϕ, so that $\mathbf{q} = \operatorname{grad} \phi$ and $\frac{D\rho}{Dt} = \rho \nabla^2 \phi$.

Let the average density of the normal sea water in the surroundings be $\rho_0 = 1.027$, and the density of the lighter water piled up to an average excess height h, $\rho_1 = 1.02$. Let the time of motion of the lighter water down and back be the period of oscillation of the vortex and the same as that of the microseisms, $T = 6$ seconds. Then, combining Newton's second law of motion with the buoyancy law, we find that $h = 2$ mm. Assuming a depth of 7 kil. and a radius of 200 kil., the kinetic energy involved in one blow on the ocean bed will be about 10^{17} ergs.

Using a formula given by Jeffreys (*Geophys. Suppl. Monthly Not. R.A.S.*, 1928, 1, 22–31), $E = 8\pi^3 \rho R \sin \Delta \frac{a^2 HV\,dt}{T^2}$, where R is the radius of the earth and ρ is its density, Δ is the arcual distance from the wave source to the point of observation, a is the amplitude of horizontal motion, H is 1.12 times the wave length, V is the wave velocity, and T is the wave period, we obtain for microseisms of 10 μ range also about 10^{17} ergs as the energy radiated in one wave.

This tentative solution is offered merely as a suggestion in the hope that it will stimulate further investigation of the problem.

JAMES B. MACELWANE, S.J.
Institute of Geophysical Technology
Saint Louis University

Verb Derived From "Fission"

The present letter was stimulated by the communication from Ira M. Freeman (*Science*, 1946, **104**, 87) in which the adjective derivable from the noun ''fission'' was discussed.

In conversations with the ''atomizers'' one often hears the verb, presumably derived from this noun. The verb, as used, is spelled ''fiss'' and pronounced similarly to ''fish.'' I maintain that if there is a verb derivable from this noun, the above verb is certainly incorrect, for it does not seem to fit into the general scheme of the derivations in English grammar. I should welcome an appropriate authoritative commentary on what seems to me an interesting variation of the language.

G. M. KOSOLAPOFF
Monsanto Chemical Company, Dayton, Ohio

Adjective Derived From "Fission"

Concerning the recent letter by Ira M. Freeman on the use of the term ''fission'' (*Science*, 1946, **104**, 87), I have found use of the word ''fissionable'' objectionable even in scientific articles. As Dr. Freeman points out, the proper word is ''fissile,'' but this is not wholly satisfactory, as it usually carries the idea of splitting into layers or plates. Might it not be wise to replace ''fissionable'' by a new word, ''fissible,'' which would be applied only to those substances capable of undergoing nuclear fission?

I would suggest that the word be pronounced as spelled. To pronounce it ''fishible'' would be unfortunate.

JOHN DAVIS BUDDHUE
Jet Propulsion Laboratory, GALCIT

Successful Use of Oxidized Cellulose in Surgery of the Uterus

During the last few years the experimental use of oxidized cellulose as an absorbable hemostatic surgical dressing has increased rapidly. The material has been used successfully in brain surgery and the abdominal cavity. Among the favorable attributes of this material are the absence of foreign-body reactions and its rapid dissolution *in vivo*.

This report is a preliminary note concerning the successful application of oxidized cellulose (kindly supplied by Johnson and Johnson) to experimental uterine surgery in the dog. Pregnant females near term were subjected to unilateral Cesarean section under pentothal or ether anesthesia. One horn of the uterus was emptied and