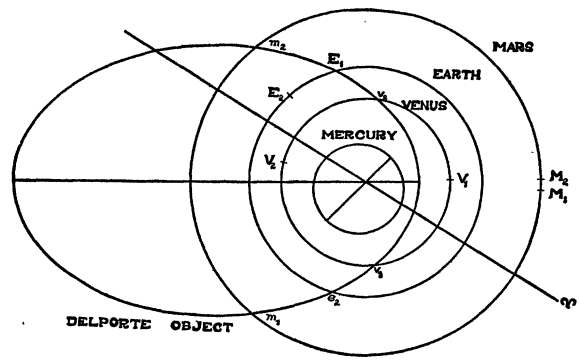

FIG. 1

due to the gravitational attractions of the major planets, let us consider the motion of the object under the gravitational attraction of the Sun alone. It would have passed the point m_2 near the path of Mars about March 17, while Mars was actually at the position marked M_2. It would again be near the path of Mars at m_1 about January 25, 1938, and again Mars will be at a distant point, M_1. It would reach e_2 near the Earth's path about March 5, 1938, at which time the Earth will be at the position marked E_2 on the diagram. It would reach the point v_1 near Venus's orbit about March 25, 1938, when Venus will be at V_1. As it approaches v_2 again, it will likely be subject to large perturbations by Venus.

Some persons have viewed with alarm the close approach of this Delporte planet, telling sad stories of what might have happened if the planet had struck the Earth. Unquestionably the results of such a collision would be unfortunate, but one finds from calculations based on reasonable hypotheses that, of all the bodies coming within a million miles of the Earth, only sixteen in a million will strike the Earth. Of those striking the Earth, about 73 per cent. will fall in oceans or seas and 23 per cent. will fall in sparsely inhabited territory. Thus, of bodies coming within a million miles of the Earth, less than one in a million will strike cultivated sections of the Earth.

It is encouraging also to note that the Delporte planet, like most objects traveling in periodic paths in this part of the solar system, is moving in the same direction about the Sun as the Earth. In the event of a collision, it would be a rear-end one rather than a head-on one. For example, when the Delporte planet was nearest the Earth, it was moving with a speed of about 23 miles per second while the Earth was traveling in approximately the same direction with a speed of 19 miles a second. The relative speed of the two was only about 4 miles a second instead of approximately 40 miles a second as in the case of a head-on collision.

Though it is impossible at the present to predict precisely where the object is going in the distant future, one need not worry too much about one's safety on the Earth.

C. H. SMILEY
WARD CROWLEY

BROWN UNIVERSITY

THE DENSITY OF PURIFIED NEVADA HOT SPRING AND SURFACE WATER

THANKS to the kindness of S. C. Dinsmore, state food and drug commissioner, the University of Nevada, in supplying me with samples of water from several Nevada hot springs, from melting snow at an elevation of 6,000 feet in Nevada near Reno and from the earth's surface near one of the hot springs, it has been possible to compare the density of these waters with the water of Lake Michigan. The Nevada surface water and the water from three different hot springs all have the same density (after purification, of course) within the limits of experimental error[1] and are lighter than Lake Michigan water to the extent of 2.8 ± 0.6 p.p.m. The density of the water from melting snow appears to be intermediate between that of the hot springs and of Lake Michigan, but the supply unfortunately gave out before the density had been exactly determined.

At the suggestion of Professor Urey the Nevada water was analyzed in order to find out whether the deficiency in density was due to the hydrogen or to the oxygen. A sample of Nevada water was electrolyzed and the cell oxygen combined with tank hydrogen; a sample of Lake Michigan water was treated in exactly the same way, the resulting water in the former electrolysis being 2.2 p.p.m. lighter than the water resulting from the latter electrolysis. Thus the difference in density between Nevada and Lake Michigan water is seen to be due primarily to the oxygen in the two waters and not to the hydrogen. One wonders if this difference is due to the isotopic exchanges theoretically treated by Urey and Greiff;[2] apparently the juvenile nature of the water affects its density in no way.

The author gratefully acknowledges the suggestions given by Dr. Charles H. Behre, Jr., chairman of the department of geology and geography of Northwestern University, regarding sources of juvenile water and the problem in general.

MALCOLM DOLE

NORTHWESTERN UNIVERSITY

ORIENTATION OF A DISK SETTLING IN A VISCOUS FLUID

To the best knowledge of the writers, all theory and experiments dealing with the position of stability of a disk settling through a viscous liquid under the force of gravity have indicated that the disk will orient itself so that its major plane is horizontal.

[1] For experimental details see M. Dole, *Jour. Chem. Phys.*, 2: 337, 1934; *Jour. Am. Chem. Soc.*, in press.

[2] H. C. Urey and Lotti J. Greiff, *Jour. Am. Chem. Soc.*, 57: 321, 1935.

Recent experiments by the writers indicate that the orientation is a function of the viscosity of the liquid. For example, the horizontal position is the position of stability for glass disks settling in water or other media of low viscosity. In a medium of high viscosity, the disks will orient themselves vertically.

A very simple and beautiful demonstration of this change in the position of stability can be made by filling a large jar two-thirds full of Karo syrup, and then filling the rest of the jar with water. When these are imperfectly mixed, the viscosity of the liquid increases toward the bottom of the jar. If now a cover-glass is dropped into the jar, it will orient itself horizontally during the first part of its fall. As it settles into the liquid of higher viscosity, this is no longer the position of stability, and it is seen to turn on edge and dive toward the bottom.

The orientation is also a function of the velocity of fall. The higher the specific gravity of the disk the deeper it will sink in the jar before turning from the horizontal to the vertical position, thus the more viscous will be the liquid at the point of turn.

This dependence of orientation on viscosity is of interest to geologists in connection with crystal subsidence in a magma reservoir. It may also explain hitherto unsolved problems in the orientation of fragments in sedimentary rocks.

ELEANORA B. KNOPF

U. S. GEOLOGICAL SURVEY

DAVID T. GRIGGS

HARVARD UNIVERSITY

THE EXPERIMENTAL MARKING OF HALIBUT

MARKING experiments with live fish in connection with the life history studies of the important species are being carried out by many governments that have commercial fishing interests. These experiments yield indispensable information on the migration of the fish, their rate of growth and the intensity of the fishery. The type of mark that can be attached to the fish varies with the species, but all investigators are agreed that the ideal mark must be one that can not be lost from the fish or overlooked by the fisherman who catches the fish and returns it. The greatest possible accuracy is desirable in determining the mortality rates and migrations from the returns.

The International Fisheries Commission has been charged by treaty to investigate and regulate the Pacific halibut fishery. Its staff has used a monel metal strap tag attached to the opercle of the eyed side of the fish. In the undoubtedly successful and extensive marking experiments it has conducted some question has remained as to whether some tags were not lost from the living fish or overlooked by the fishermen. New marks to be affixed to the halibut in addition to the present monel tag have been devised. It is believed they may prove of general application to investigations of this type. The marks experimented with are of two types.

First, a tattoo mark consisting of the initials I. F. C. and a number was made on the cheek or nape of the neck on the white side. The number was added so that in case the strap tag should be lost the date and locality of marking could still be traced. The tattooing was done with Higgins American Waterproof India ink and a hypodermic needle attached to a small metal hypodermic syringe. With each puncture of the needle a little ink was pressed in and sufficient punctures were made to form the letters and number indicated above. The whole procedure took less than one minute to perform.

Second, tags were placed in the body cavity of the halibut. These were manufactured from No. 60 orange-red celluloid and stamped with a number and legend for recovery. They were 64 mm long by 22 mm wide at one end, tapering down to 18 mm at the other. This tapering was made to facilitate the insertion of the tag through an incision made on the posterior part of the abdomen on the eyed side, the incision being just large enough to admit the small end of the tag. The tag when inserted into the body cavity is lodged among the intestinal caecae, and is recovered when the fish is being eviscerated. The chances for its recovery have been greatly improved since the livers of the fish are now carefully removed from among the viscera and are sold for medicinal purposes.

In May and June, 1935, 596 halibut were tagged on the Goose Island Grounds situated in Queen Charlotte Sound, British Columbia. Of these 343 were tattooed and 253 were marked with the celluloid body cavity tags. Up to September 6, 1935, when this general area was closed to commercial fishing, there have been 28 or about 8.2 per cent. of the tattooed fish returned and 12 or 4.7 per cent. of those carrying the celluloid tags. No tattooed fish or those carrying celluloid tags were recovered without a metal tag still firmly attached.

Of the 28 returns with tattoo marks it was found that this mark was noticed before the metal tag in 24 cases, and in two cases it was noticed on the fish in the water before it was landed. In every case the tattoo mark was almost as clear when recovered as when it was put on. Microscopic examination reveals that the carbon particles of the ink have lodged in the scale pockets, epidermis and underlying muscle tissue, and the surface particles of ink have been covered by a thin layer of transparent epidermal tissue. This epidermal regeneration is complete in every case after