

Earth's Rotation Speed Changing Daily

Astronomy

Every day the earth changes a little in its rate of rotation.

This is the opinion of Dr. Benjamin Boss, director of the Dudley Observatory, and director of the Department of Meridian Astrometry of the Carnegie Institution of Washington. Furthermore, this variation appears to be related to the frequency of earthquakes, and so further investigation of it might aid in the study of quakes.

Dr. Boss has found evidence for this apparent variation in a long study of star positions. At the Dudley Observatory an exhaustive catalog of star places is in preparation, and in the work on this it has been found that a considerable correction, which varies annually, is needed for the right ascension of the stars. The right ascension is the celestial equivalent of longitude. As a telescope permanently placed on the earth would point to different right ascensions in the sky as the earth turns, any change in the rate of the earth's rotation would affect the right ascensions of the stars.

For sometime, says Dr. Boss, it has been known that the sun, the moon,

and the planets Venus and Mercury, undergo changes indicating the variable rotation of the earth over long periods of years.

The annual change in the star positions, says Dr. Boss, can be explained by a daily variation in the rate of rotation of the earth. Possible evidence in favor of such a variation is suggested when checking clock time with the stars, for it has been found that there is a daily variation in the clock rate, which indicates that the earth may change daily in the rate of its rotation.

That the changes in the moon and stars are both due to the same cause is indicated by the fact that when the minor fluctuations in the moon's path, and the variation in star positions, are plotted over a long period of years, the curves are closely similar. About 1860 both curves reached a minimum, while about 1900 they were both at a high mark. Since that they have been going down, until 1920, when the moon fluctuation reached a minimum. For the last ten years the figures for the star variations have not been completed, but they also seem

to have reached a minimum about the same time. Dr. Boss believes that this indicates very strongly that the two variations are due to the same cause.

What this cause may be is not certain, but Dr. Boss thinks that it is very likely to be the result of tides in the earth. This view is supported by the fact that Dr. A. A. Michelson, of the University of Chicago, has actually obtained experimental evidence of earth tides. Ocean tides are not sufficient to account for the observed phenomena, but if the outer crust of the earth is in a condition such as recent investigation supposes it to be, tidal friction might appreciably affect the rate at which the earth turns.

According to Dr. Boss, the tide might produce the long period changes by the fact that the crust of the earth lifted at high tide, fails to settle back to its original position. Thus the earth's diameter is gradually increased, slowing its rotation. When a critical point is reached, it gradually starts to settle, speeding up rotation.

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Radio Reproducers

Study of such devices as radio loud-speakers on the basis of the sound waves that come to the listener's ear is now possible with an instrument invented by Dr. Dayton C. Miller, of Case School of Applied Science, Cleveland. At the recent meeting of the American Physical Society in New York Dr. Miller described this new use of his apparatus, which he calls the "phonodeik." He made the experiments in conjunction with John R. Martin.

The phonodeik makes a photographic record of the sound wave as it is received by the ear. Dr. Miller's method is to connect the loud speaker undergoing test to a microphone, then to record the output on the phonodeik. A similar record can be made of the original sound, and by comparing the two, the characteristics of the speaker determined. When a vacuum tube voltmeter is substituted for the speaker, the experimenter can determine how much distortion is introduced by the electrical system, and make allowances for it.

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New Vitamin for Trout

Physiology

A new vitamin, designated as "Factor 'H'" by its discoverers, has been added to the list of these mysterious accessory food substances required for normal health and growth in animals. It is found in raw liver, and to a slight extent in dried milk, and so far as is yet known is needed only by young trout. With it they grow normally, without it they die.

The discovery was made by C. M. McCay, F. C. Bing and W. E. Dille of Cornell University, and announced in *Science*. It came as the result of an effort to learn the scientific reason underlying the common practice in fish hatcheries of feeding young trout on raw liver. Groups of fingerlings were kept in isolated feeding pools, and supplied with carefully compounded rations. Some of these included various known vitamins and some of them no vitamins at all. One group received a vitamin-free diet with a certain amount of dried milk added. None of the fish got any liver at the start.

One by one all the groups of young fish died, although the ones receiving dried milk along with their food outlived the rest. Finally one group of

survivors was allowed to have its normal diet of raw liver. Immediately they "picked up" and began to grow rapidly. The investigators therefore concluded that young trout need, for life and normal growth, something that is found in raw liver and to a less extent in dried milk, but yet is not any known vitamin.

Further experiments showed that dried and cooked liver would not have the same results as the raw meat when fed to young trout, and that a "synthetic" milk, compounded out of substances normally found in natural milk, was also unavailing to keep the little fish alive.

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Gladiolus Disease

Plant Pathology

A rot disease of the corms, or "bulbs," of gladioli has been traced to a new species of fungus by Lucia McCulloch and Dr. Charles Thom of the U. S. Department of Agriculture. The fungus belongs to the same genus as does one form of the common blue mold of oranges and other fruits, and has been named *Penicillium gladioli*.

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