be the same whether one use a microscope, a telescope, a retort, a syllogism or an algebraic equation.

The University of Chicago has gone for its new president, Dr. Max Mason, to the University of Wisconsin. He is also preeminently a man of research, with a varied experience as a teacher, both in Eastern institutions and in the Middle West. His going to Chicago gives new emphasis to the purpose which has guided its development since its renaissance under that great scholar and teacher, Dr. William R. Harper, a purpose which has expressed itself in the motto "Let knowledge grow that life may be enriched," and has exemplified itself in practice by calling to university professorships such men as Chamberlin, Michelson, Hale and Millikan.

The faculties of the first of all American universities of the purest type were gathered about a teacher of mathematics, a teacher of Greek and a teacher of chemistry who were the first of scholars in their respective fields. And the University of Chicago owes its swift rise to its policy of gathering men of first-rate scholarship as its master teachers. This precedent has been followed in selecting the new leader. He is a mathematician, and if he needs defense in these days when all scientists are under Fundamentalist suspicion, it may be found in an admirable address delivered by David Eugene Smith before the Mathematical Association of America some years ago, entitled "Religio Mathematici." According to him, mathematics but increases the faith of a man who has faith, and while it shows him his finite nature with respect to the Infinite (for example, shows him that he can not construct a seven-edged polyhedron and is only combating the everlasting truth in trying to do so), it puts him in touch with immortality in the form of mathematical laws that are eternal.

In the midst of all the changes in things thought to be unchangeable it has been true, it is true and will be true throughout the universe and forever that $(a+b)^2 = a^2 + 2ab + b^2$. This is but one illustration of the immortality of law. A great mathematician, other things being equal, ought to be best prepared

> from facts compared the laws to trace
> Where long procession leads to Deity,

and so best prepared to lead on in further quest of truth.—Editorial from *The New York Times*.

SCIENTIFIC BOOKS

Fishes of the Gulf of Maine. By HENRY B. BIGELOW and WILLIAM W. WELSH. 1925. Bureau of Fisheries, XL, Part 1, pp. 1 to 567; figs. 1 to 278.

THIS is a bulletin just issued by the U. S. Bureau of Fisheries as part 1 of volume XL for 1924. It should be in the hands of all persons interested in the marine fishes of our eastern seaboard. The term Gulf of Maine as here used "covers the oceanic bight from Nantucket and Cape Cod on the west to Cape Sable on the east, thus including the shore lines of northern Massachusetts, New Hampshire, Maine and parts of New Brunswick and Nova Scotia." The 150 fathom contour has been chosen as the arbitrary offshore boundary of the region. Some 178 species are treated.

Looked at as a faunal work, this book is an adequate review of the cold-water group of fishes which is at home north of the long arm of Cape Cod, and penetrates only to a limited extent south of that cape, then mainly in winter. Descriptions of the species make of it a handbook for their ready identification, and it is very consistently illustrated with figures of each, and in many cases of their larval forms or fry also. It is comparable (except that fresh-water fishes are not included) to "The Fishes of North Carolina," by H. M. Smith, issued in 1907 by the North Carolina Geological and Economic Survey, and should prove equally useful. The two practically do not overlap; on the other hand they supplement one another admirably, one dealing with the cold-water, the other with the warm-water fauna of our eastern coast, north of Florida.

Advances have recently been made in knowledge of the breeding and life histories of marine fishes. Considerable data on this subject given by Bigelow and Welsh, when not new, is at least recent, and may conveniently be referred to in this volume. The young of sea fishes still offer a wide field for inquiry, in which Mr. Welsh was particularly interested, and that branch of the science of ichthyology has suffered an irreparable loss in his death. Fish migrations, a problem allied to oceanography, and one which has important economic bearings, is frequently discussed. Such discussion here is particularly interesting in view of Dr. Bigelow's knowledge of oceanography.

We look forward to the second part of this bulletin, which, as we understand it, will deal with the general biology and oceanography of the Gulf of Maine. As a memoir on the fishes this first part is complete in itself, ending with eighteen pages of bibliography and an index.

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SPECIAL ARTICLES

MUSCULAR FIXATION OF THE STUTTERER'S VOICE UNDER EMOTION

IT has been long known that stuttering is increased by an emotional experience. This fact should give

one a clue to an experimental attack upon the nature of the trouble. The voice of the stutterer can be studied under controlled emotional circumstances and, by a sufficiently refined technique, it ought to be possible to determine how these affect the voco-motor mechanism. This mechanism in its entirety is, of course, too complex and too extensvie to be brought within the scope of one experiment, but a part of it can be subjected to a single study.

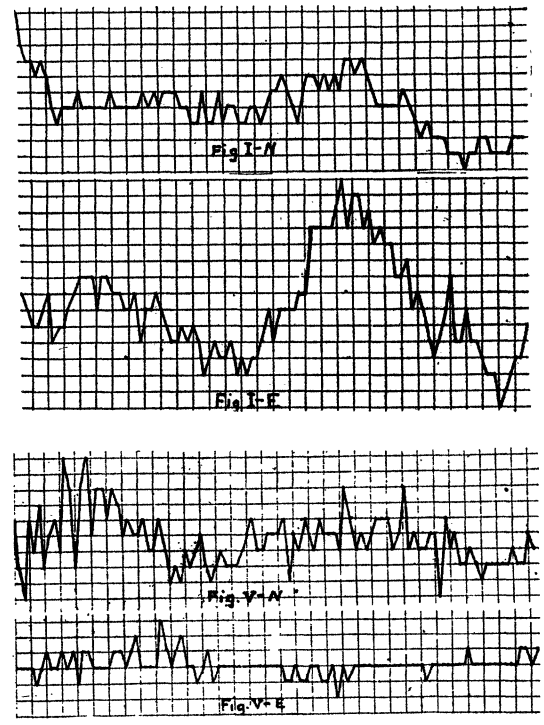
In the study, of which this is a preliminary report, I undertook to compare the changes produced in the voice of the stutterer under emotional conditions with the changes produced in the voice of the non-stutterer under like circumstances. These changes in the voice were detected and studied by means of the photographic method of recording speech. Nineteen stutterers and eighteen non-stutterers were studied under identical circumstances. The unemotional condition was as free from anything conducive to emotional arousal as possible. The observer was placed at ease by an explanation of the mechanics of the photographing apparatus, conversing about current topics, asking questions relative to athletic and scholastic interests and other quieting talk. When the observer seemed to be completely at ease he was required to sing a sustained "ah" into the photographing apparatus and a picture of this sound was taken.

Immediately following the obtaining of this photograph, the observer was emotionally upset; first, by questioning and suggestions, second, by the firing of a pistol, and third, by an electrical shock. He was now asked to produce a tone as nearly like the one before as possible and a picture of this tone was taken.

The pictures of the voice were studied from the standpoint of fluctuations in wave length or pitch and measured with adequate precision. When I undertook the study I anticipated, in harmony with the fact of the emotions increasing stuttering, that the stutterer's voice would be much more upset after the emotional shock than the non-stutterer's. That is, I thought I would find greater variability in pitch in the case of the stutterer than in the case of the non-stutterer when the two had been subjected to the same emotional circumstances. To my surprise just the reverse was true, namely, that the stutterer has far less variability in pitch after an emotional shock than he does before, while a non-stutterer has more fluctuation in pitch after an emotional shock than before.

Thus we see that instead of the emotional upheaval producing a muscular lability in case of a stutterer, it produced a muscular fixation wherein the muscular balance that was taken to produce the "ah" was rigidly maintained.

The four following figures which are typical graphically illustrate the differences in effect of the emotive stimuli upon the voice of the stutterer and the non-stutterer. The ordinate scale gives the length of the waves .1 mm to a square, while the abscissa indicates



successive waves three to a square. Figure 1–N gives the wave-length fluctuations of a non-stutterer under the non-emotional condition, while Figure 1–E gives the wave-length fluctuations of the same non-stutterer after the emotional upset. It is easy to see the greater number and extent of changes in wave-length or pitch for Figure 1–E. Figure V–N gives the wave length fluctuations of a stutterer under non-emotional conditions while Figure V–E gives wave-length fluctuations of the same stutterer after the pistol shot and the electrical shock. In these two figures, notice the marked elimination of wave-length changes for Figure V–E. Whether this muscular fixation in the case of the stutterer extends to muscles other than those controlling voice production this study can not answer. Neither can it answer the question, What is responsible for the muscular fixation of the stutterer after an emotional shock? This latter question, however, is being investigated at the present time.

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