

that reference should be made to the fact that the first map of this character published in the United States was constructed by Dr. Wm. McMurtrie and published in a special report, No. 28, of the U. S. Dept. of Agriculture in 1880. In Dr. McMurtrie's map the area of successful beet culture was indicated by a region contiguous to a line showing a temperature of 70° Fahrenheit during June, July and August and rainfall above two inches for the same months.

The remarkable success which attended the growth of sugar beets in the semi-arid regions of California in the early '80's led me to discard the factor of rainfall and to construct a map based upon temperature conditions alone, during the growing season. Some of the very best areas in the United States, suitable for beet culture are in arid and semi-arid regions. The idea, however, of mapping the beet areas in this country should be credited to Dr. McMurtrie.

H. W. WILEY.

JORDAN ON FOSSIL LABROID AND CHÆTODONT
FISHES.

IN a recent paper on Eocene fishes from Monte Bolca, the present writer followed Dr. D. S. Jordan in his excellent 'Review of Labroid Fishes' (*Rept. U. S. Fish Comm.* for 1887 (1891), pp. 559-699) in uniting Cuvier's genus *Crenilabrus* with the earlier described *Symphodus* of Rafinesque. He also adopted the views of Agassiz and most recent authors in referring *Pygæus* to the Chætodonts. Since this paper was published,* the writer has received from President Jordan some valuable notes on the relations of the Eocene forms to existing genera, and as these are of extreme interest to students of both fossil and modern faunæ, advantage is here taken of his permission to make them available for others.

The following extracts may be considered as the most recent and authoritative opinion that has been pronounced upon the affinities of the forms in question.

DEAR DR. EASTMAN:

The following notes are at your disposal for any use you may care to make of them. I should now separate *Crenilabrus* C. & V. as a valid genus

* *Bull. Museum Comp. Zool.*, Vol. XLVI., No. 1, June, 1904.

from *Symphodus* Raf. (= *Coricus* C. & V.), with which I united it in 1891. *Symphodus* (*scina*) has the general characters of *Crenilabrus*, the serrated preopercle and other features, but it has the snout strongly produced, giving a concave profile, a matter probably worthy of generic distinction. *Crenilabrus* like *Symphodus* has 13 to 15 dorsal spines, and 31 to 33 vertebrae. I do not see how *C. szajnochæ* can be properly placed in it, as these numbers are fairly constant within the same genus. *C. szajnochæ* should form the type of a new genus.

Pygæus appears to be a generalized type, with traits ancestral to the Chætodonts, the Acanthuridæ, and to *Siganus* (*Amphacanthus*). It has the long and strong dorsal spines and the numerous anal spines of *Siganus*, as well as the few soft rays, large vertebrae and the general form of the body. The teeth are apparently much as in *Siganus*, and not brush-like as in the Chætodontidæ. The Siganidæ are scaleless, but in *Pygæus* the scales are small and prickly-like as in the Acanthuridæ and Zanclidæ.

The ventral fins in *Pygæus* seem normal (I., 5), but in *Siganus* the inner ray is also a strong spine, the formula being I., 4, I. In most Chætodonts there are but three anal spines, and no more in any of the Acanthuridæ. *Megaprotodon*, a genus of Chætodonts, has, however, four anal spines, and its form suggests resemblance to *Pygæus*.

Taking the somewhat minute differentiation of families accepted amongst recent fishes, *Pygæus* may be made the type of a family Pygæidæ, allied to *Siganus* on the one hand, and to *Megaprotodon* and *Zanclus* on the other; and, perhaps, related to the common ancestor of all these. * * *

After Gill I use the name '*Teuthis* L.' for *Teuthis hepatus*, for which Linnæus devised the name. This is equivalent to '*Acanthurus*' of most authors. Forskål's original *Acanthurus* (= *Monoceros*, = *Naseus*) has two hooks on the tail instead of a sharp spine, the ventrals being I., 3, instead of I., 5. *Acanthurus gaudryi* will probably turn out a new genus near *Teuthis*, but not quite the same. In our day *Teuthis* has nine dorsal spines and a movable caudal spine. *A. gaudryi* is nearer the Pacific genus *Zebrasoma*, which has three to five dorsal spines and the soft rays high. * * *

DAVID S. JORDAN.

It should be noted that Agassiz suggested the propriety of dividing *Pygæus* into two groups, *P. bolcanus* being taken as type of the one, and *P. coleanus* of the other. President

Jordan's remarks apply to the species resembling *P. bolcanus*. C. R. EASTMAN.

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THE ASCENT OF WATER.

TO THE EDITOR OF SCIENCE: The identity between leaves and roots of trees which is signalized by the criticism in your last issue probably signifies that they have the same sort of resemblance as the entrance and exit of a building. But the critic can not be entirely ignorant of the recent researches which establish their antithetical relation so far as the contention of my paper is concerned. Near the leaves the ducts have an extreme vacuum, so long as transpiration from the leaf-surface continues; this vacuum diminishes downwards towards the base of the stem, as in a suction pump; and the inward current of water at the base is still dependent (when root-pressure is inactive) on a difference between the atmospheric pressure and the tension within the ducts. The results and authorities are summarized in Pfeffer's 'Physiology,' also in E. B. Copeland's paper in *Botanical Gazette* (October 19, 1902), and in Livingston's valuable book on 'The Rôle of Diffusion.' Whilst using these results my paper added nothing to them. Its only aim was to remove a stumbling block which was caused by the tortious assumption that atmospheric pressure can not lift water more than 1033 centimeters high. As the mixture of air and water within the ducts appears to be in the condition of foam, such pressure probably suffices to elevate it to the top of the loftiest trees. This is the part that ought to be criticized.

I am much obliged to the editor of SCIENCE for permitting me to submit the facts to his great constituency. And now I wish to withdraw from the case, and to leave its further consideration to others. G. MACLOSKE.

PRINCETON UNIVERSITY,
August 8, 1904.

ANALYSIS OF A COMPLEX MUSICAL TONE.

THE analysis of a musical tone by means of Helmholtz's resonators makes a good lecture experiment when so carried out as to be heard

by a large audience. Whether this has been accomplished by others I do not know, but I have succeeded as follows: A telephone receiver is connected to alternating current lighting mains (frequency 133 cycles per second) through a resistance sufficient to reduce the current to about $\frac{1}{8}$ ampere. The telephone then emits a tone having a fundamental pitch of 266 vibrations per second, and of which the overtones are prominent.

An adjusted resonator held over the mouth of the telephone strengthens the overtone to which it is tuned so as to make the overtone easily audible throughout a large room.

I have had no difficulty in demonstrating eight successive overtones in this way.

W. S. FRANKLIN.

SPECIAL ARTICLES.

THE EFFECT OF RADIUM RAYS ON THE COLON BACILLUS, THE DIPHTHERIA BACILLUS AND YEAST.

THE discovery that rays emitted from salts of radium may be used therapeutically in the treatment of some diseases, has opened an interesting field for conjecture as to the manner in which these rays act, and naturally suggests experiments concerning their effect on bacteria in general, and especially on specific micro-organisms.

A few investigators have already published results of such experiments. Pfeiffer and Friedberger,* for example, found that typhoid fever bacilli were destroyed by exposure to the action of radium rays for forty-eight hours at a distance of about 1 cm., but not at 5 cm. distance. They found further that the bacteria only were affected, and that the culture medium remained unchanged. Anthrax spores dried on silk threads were destroyed after exposure for three periods of twenty-four hours each, but not after two twenty-four-hour exposures. G. Bohn† has also reported that 'lower organisms' are quickly destroyed by the action of radium rays.

* Pfeiffer, R., and Friedberger, E., 'Ueber die bakterientötende Wirkung der Radium-Strahlen,' *Berl. klin. Wochenschrift*, 1903, No. 28.

† Bohn, G., 'A propos de l'action toxique de l'emanation du radium,' *Soc. Biol.*, 55, p. 1655.