anatomy is shown by the fact that on investigating the soft parts certain apparent species of *Physa* of the Hawaiian Islands turned out to be sinistral forms of the *Lymnaea* type. One of the New Caledonia species, *Physa varicosa* of Gassies, has been referred to *Bulinus*, which has nothing to do with true *Physa*. Thus the whole *Physa* fauna needs reinvestigation.

The recorded fresh-water bivalves include a remarkable endemic species, *Cyrena sublobata* Deshayes, and certain species of *Batissa*. It turns out that the latter were reported in error; the genus exists in the Fiji Islands, but not in New Caledonia. We must now add a quite different type of shell, belonging to the mytiliform (mussel-like) groups. These mollusks mostly inhabit the sea, but derived from the marine stock, and now very widely distributed in fresh waters, is the family Driessenidae.[2] They exist in Europe, Africa, America and, according to Dall, China and the Fiji Islands. Typically marine are the Mytilidae, represented by the common mussel of our coasts. But the genus *Modiolus* has fresh-water species in Asia, and *M. fluviatilis* (Hutton) occurs in brackish water throughout New Zealand. The related genus *Modiolaria* is marine, but I found a species common in river drift near Bourail, New Caledonia. In New South Wales *Modiolaria subtorta* Dunker is found in fresh or brackish water, but it is so distinct that Iredale has made it (1924) the type of a distinct genus, *Fluviolanatus*. When, in the Australian Museum at Sydney, I showed Mr. Iredale my New Caledonia *Modiolaria,* he produced another fresh-water species from that island, collected by Brazier in the La Foa River! This is quite distinct from mine, being in fact a *Fluviolanatus*. Mr. Iredale kindly gave me a specimen; he will later describe the species. My species, which I will call *Modiolaria bourailensis* n. sp., has a general superficial resemblance to *M. varicosa* Gould, a marine shell found at Sydney. It is, however, quite different, being like *Fluviolanatus* in lacking the sculptured ribs, and in having the beaks less terminal. In place of the sculptured ribs, running to the posterior end, is a pattern simulating them, of straight pale red rays alternating with straw-yellow ones. This is superimposed on a pattern (also seen in *M. varicosa*) of vertical curved or zigzag brown bands at rather wide intervals. The shell is thin, with a pale yellow epidermis, not at all produced into bristles. The upper margin is elevated and obtusely angulate in the middle, a feature quite lacking in *Fluviolanatus,* but somewhat indicated in the broader and (anteroposteriorly) shorter *M. varicosa*. Looking at the shell from within, the beaks are much less prominent than in *Fluviolanatus*. The anteroposterior diameter is about 10 to 11 mm; dorsoventral about 5.3 mm; thickness about 3.2 mm. The upper margin, from the beaks to the highest elevation, is tuberculate within, the tubercles being smaller, much closer and more numerous than in *M. varicosa*. There is no trace of a myophore, such as exists in *Congeria*. The shells were found in numbers in river drift, with many other fresh-water and land shells, close to the sea. The question arose whether they could possibly have been blown from the sea-beach. This idea must be rejected, as there is no such marine species known in the region, and the material was intimately mixed with the river drift. The thinness of the shells suggests life in fresh water.

[2] For the spelling, see Pilsbry and Bequaert, "Aquatic Mollusks of the Belgian Congo," 1927.

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AUGUST 28

ATMOSPHERIC ELECTRICITY DURING SANDSTORMS

IN the issue of SCIENCE for May 3 appeared a note by R. H. Canfield regarding "Atmospheric Electricity during Sandstorms." Phenomena very similar to those described have repeatedly been observed here in our physics laboratory. A number of times during sand storms I have connected our radio transmitting aerial through a galvanometer to earth, and find that there is a more or less continuous flow of current from aerial to earth. The strength of current in general seems to correspond to the violence of the storm, sometimes exceeding twenty micro-amperes. Our aerial is of the triangular flat top variety supported by steel masts forty feet above the roof of the laboratory and very well insulated.

An undamped electrostatic voltmeter of very short period if connected to the aerial during a storm is set into vigorous vibration indicating a rapidly fluctuating potential of more than 20,000 volts. This is to be expected because of brush discharge from the lead in wire. During one storm while the discharge flowed through the galvanometer the needle indicated a reversal of the direction of discharge a number of times though each time for an instant only. I was somewhat surprised to find the aerial potential drop to almost zero before the first drops of rain fell and the first flash of lightning. During the thunderstorm that followed the potential of the aerial remained undisturbed at zero.

It has been suggested that this phenomenon is due to triboelectricity, but it is interesting to find that on a perfectly still day when the air is heavily laden with dust the aerial potential may fluctuate for hours between 5,000 and 10,000 volts, though if earthed through a galvanometer the current amounts only to about one micro-ampere.

Self-recording apparatus is being constructed which we hope will prove useful in a more detailed study of the matter.

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THE PHYSIOLOGY OF THE SINGING VOICE

WITH Miss Minnie K. Willens, of the graduate department of the University of Denver, I have made preliminary studies on the physiology of the voice with special reference to the relation of the respiratory mechanism to the voice mechanism in the formation of tone. The study indicates that the respiratory muscles, in addition to their rôle of providing a moving column of air to be interrupted by the vocal mechanism in the formation of the voice, are important synergists of the intrinsic and extrinsic muscles of the larynx in tone formation, and that the maximum tone range and the optimum tone quality are attainable only by utilization of such synergistic action. This conclusion is at variance with the accepted practice of vocal instructors of encouraging the use of a single type of breathing—the costo-diaphragmatic. The later type of breathing has been favored and assumed to be the best because it produces the greatest vital capacity, involves a minimal respiratory rate for a definite volume of air, and supposedly reduces respiratory fatigue as a consequence. However, fatigue of the powerful respiratory muscles is a very remote contingency in singing, whereas strain and tiring of the delicate musculi vocales (thyroarytenoides) is a very frequently observed phenomenon. The employment of different types of respiration for different tone ranges—*viz.*, chest breathing for the higher tones, costo-diaphragmatic breathing for the intermediate tones and abdominal breathing for the lower tones—minimizes the strain upon the laryngeal musculature by altering the relative position of the shoulder girdle to the upper attachments of the larynx, the base of the skull, the lower jaw and the spine, and thereby alters the tension and tonus of the various groups of laryngeal muscles involved. Moreover, singing in this manner results in improvement of tonal range and quality and of vocal resonance. Complete results of the study will be published in the future.

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A POPULAR FALLACY ABOUT HARDNESS

THERE appears to be a popular idea that a softer substance constantly rubbed over a harder one will in time wear the harder one away. Nearly any cigar store clerk will tell you this in explaining how his glass counter has become so thoroughly scratched up that the cigars can not be seen beneath it. A casual examination will show that such a surface is produced by an accumulation of definite scratches which no copper, silver or nickel coin can make. It is true that where most scratches are made most coins are passed, but at the same place most sand grains, dust particles and ring settings are also rubbed against the plate glass of the counter.

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THE PREPARATION OF CHARTS FOR REPRODUCTION

IN the making of charts and graphs which are to be reproduced in publications, it is always desirable to make certain that the smallest details such as lettering, character of lines where several curves are shown on the same coordinates, etc., will show clearly when reduced to the size of journal illustrations. Likewise, when one wishes to place several charts on the same page of text, it is necessary to know how much reduction can be made with safety to the small details. The following rough-and-ready method will give this information without the labor of making measurements and computations:

Pin the chart to the wall. With a foot or so of twine in your hand, back away from the chart to the furthest point from which the smallest detail is clear. Hold the string at the level of your eyes at reading distance from them and parallel to the wall. Fixating the chart, move your hands apart on the string until your two thumb-nails are tangent to the vertical borders of the chart. Measure the length of string between your thumb-nails, which will be the minimum width the chart may have after it is reduced for publication.

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ORGANIC SYNTHESES

THE board of editors of *Organic Syntheses* (an annual publication of satisfactory methods for the preparation of organic chemicals) has decided to collect, revise and rearrange the preparations described in the first nine volumes in such a way as to make them more suitable for general use in synthetic organic chemistry. All these preparations are to be published in a single comprehensive volume to be designated as the "Collective Volume—Revision of Volumes I–IX."

In this work of revision we would greatly appreciate suggestions in the way of corrections, difficulties in checking, new and improved methods, etc.

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