maintain themselves absolutely distinct. This should convince any one who may still entertain any doubt regarding it that in the presence of Mendelian hybridization, no form of physical isolation is necessary for the maintenance of closely related forms. Moreover, these observations on *Bursa* show that Mendelian behavior is a strictly normal natural process and in no manner dependent upon the artificial conditions supplied by garden practise.

When a new form arises, differing from the parent in one or several unit characters, these new characters may be either dominant or recessive to the corresponding character of the parent. Less rarely they are neither dominant nor recessive. The chances of survival under these several possible conditions seem to need discussion, since, in several recent conversations, I have found the notion to prevail that recessiveness is a handicap, and allusions based upon the same idea have found their way into print. This view is quite erroneous; not only has the dominant form no advantage in the competition which the newly arisen elementary species must encounter, but it can be shown that under certain conditions the reverse is true.

If the dominant and recessive forms are equally adapted to the particular environment in which they live, there is absolutely no advantage in favor of either. The second generation of a Mendelian monohybrid contains the same number of pure recessives as of pure dominants, and the heterozygotes continue to produce in each succeeding generation just as many recessives as extracted dominants. The chances that extracted dominants will self-fertilize or that they will cross with other extracted dominants are exactly the same as the chances that recessives will self-fertilize or cross with other recessives. In like manner extracted dominants and recessives will cross with heterozygotes with equal frequency, and the quantitative results in these two cases will be exactly parallel, in one instance giving fifty per cent. of pure dominants, in the other case fifty per cent. of pure recessives. In this equal fashion the struggle will continue indefinitely so long as the premise holds, that the two forms are equally well suited to the conditions under which they must grow.

The situation is different when natural selection favors one or the other of the competing forms. A single extreme case will suffice to demonstrate: Let us suppose that the new form is dominant over its parent, but so poorly adapted to the particular habitat in which it originated that it can not successfully compete with the parent form. All the hybrid offspring resulting from crosses between the mutant and its parent will have the unadapted new form, and when the selection becomes extreme, not only will all the pure-bred specimens of the new form be destroyed, but all the hybrids as well, and in this way every vestige of the new form will be entirely lost. Assuming, on the other hand, that the mutant is recessive to its parent but that in other respects the conditions are the same as before, the extreme selection that is assumed to destroy all the recessive individuals, leaves the heterozygotes living because they have the successful form possessed by the parent species. These successful heterozygotes give rise to a progeny in the next generation including the recessive form, and also a considerable percentage of heterozygotes that may carry the form on to still another generation, and in this way the recessive mutant may be preserved indefinitely under the protection of the dominant characteristics of its more successful parent. Such prolongation of the life of a recessive may serve to tide it over times of special stress, or may continue its existence until the various distributing agents have carried it beyond the limits of the habitat in which it is a failure into others in which it may become a success.

GEORGE H. SHULL
STATION FOR EXPERIMENTAL EVOLUTION,
COLD SPRING HARBOR, L. I.

NEW PROCESSES OF TAKING IMPRESSIONS OF NATURAL MOLDS OF FOSSILS

ONE of the perplexing problems which confront the invertebrate paleontologist is that of finding some substance with which an accurate and permanent cast or impression of natural molds of fossils can be made. In

attempting to solve this problem quite a number of substances have been tried by the writer, such as plaster, gutta percha, wax, modeling clay, etc., and when the relief is not great and other conditions are favorable, some acceptable impressions have been made. In many cases, however, the shape of the mold is such that the opening, through which the cast must be drawn, is too small to allow it to pass, if the above substances are used, or the sculpturing, on the plates of a crinoid, for instance, is so delicate that in drawing a rigid cast out of a rigid mold, the finer markings are destroyed.

The properties which a substance must possess to give a reproduction of the form of a shell over which a natural mold was formed are: (*a*) ability to become liquid or plastic to such a degree that it can be forced into every crevice of the mold; (*b*) little or no shrinkage in cooling or drying; (*c*) elasticity, to insure its resuming its original form after the distortion necessary in drawing the cast out of the mold and (*d*) durability. Glue possesses most of these properties and gives satisfactory casts for some purposes, but they shrink after a day or two. A substance found very satisfactory when the molds are large and the ornamentation not too delicate is the so-called 'roller composition,' such as is used in making the ink rollers on printing presses. This composition, which can be purchased at any printers' supply house, is used as follows: Melt the composition in a double glue pot, to avoid burning, as a comparatively high temperature is needed. Heat the natural molds as hot as they can be handled and thoroughly oil with lard oil just before the composition is put in. Keep the mold hot for five or ten minutes after the composition is put in and stir the composition to allow any air bubbles to rise to the top, otherwise the mold may not entirely fill. After the composition is quite cold it can be removed from the mold and will last for a long time without shrinking. The writer has some casts that were made in 1901 from this substance and they are still in good condition.

When the molds are small and irregular with delicate sculpturing, the writer was unable to get rid of the bubbles or to obtain sharp impressions with the composition. Unvulcanized rubber, such as is used for making rubber stamps, was tried and by vulcanizing it in the molds, under pressure, very satisfactory casts have been made on which the surface markings are perfectly preserved. The process is as follows: Dust the inside of the mold and anything that is to come in contact with the rubber with talcum powder to prevent sticking. Cut the rubber in small pieces and, after cleaning in benzine, pack it tightly into the mold, until the mold is a little more than full; then put the mold in a screw clamp to press the rubber while it is vulcanizing and insure complete contact throughout the mold. The vulcanizing is accomplished by placing the mold in a drying oven heated to 135° or 140° Centigrade. The time required varies from half an hour to an hour or more according to the size of the mold.

Arthur W. Slocom
Field Museum of Natural History

PIERRE EUGÈNE MARCELLIN BERTHELOT[1]

France, for the third time in the space of a few months, mourns the loss of an illustrious savant. Again the nations of the world extend their sympathy. The heroes acclaimed were not martial victors over mankind, whose honors were bought in the price of blood, but men of lofty ideals who conquered nature, brought truth to light, instituted new industries and improved old ones, thus bettering man's physical, and through enlightened thought elevating his moral condition. Truly 'science guides humanity.'

Curie, Moissan, Berthelot! How varied the achievements of each, though each chose chemistry as a field of labor. How differently each worked out his task and how successfully.

Berthelot was born in Paris, October 25, 1827. His father was a physician, and the young man inherited not only a taste for a scientific career, but was schooled most effectually for it. His education at the Lycée Henri IV. developed the taste for historical research

[1] Read at the meeting of the New York Section of the American Chemical Society, April 5, 1907.