and the sand used usually contains more or less iron. During the process of its manufacture the iron enters into the composition of the glass, and if present as a ferrous compound gives to the glass a green color. To dissipate the green color manganese peroxide is added to the melt for the purpose of oxidizing the ferrous iron to the ferric state. Under these conditions if only a small quantity of iron be present the pale yellow of the ferric salt will not be observed; besides, the yellow will be neutralized by the violet of the manganese salt, thereby producing a colorless glass. Now it is well known that glass decolorized with manganese slowly becomes red-violet when long exposed to light, but remains colorless when protected from the light. The phenomenon is merely an instance of chemical action in solid solutions; the effect of heat shows it to be a reversible reaction. The amethystine color is due to the presence of a manganese salt. Light promotes the development of the manganese salt; heat reverses the reaction.

HENRY WINSTON HARPER
THE UNIVERSITY OF TEXAS,
AUSTIN, TEXAS,
May 25, 1908

TO THE EDITOR OF SCIENCE: Professor Cockerell's note on the coloration of glass, published in SCIENCE of May 22d, seems to call for a word of discussion. It is not necessary to go to arid regions to observe the phenomenon. The globes of the street-lamps used in the City of Philadelphia, colorless when first put up, become in the course of two or three months distinctly violet, and in a year very strongly so. That the effect is the direct result of exposure to sunlight is proved by the fact that those surrounded by trees require a much longer time for the appearance of the color.

As to recent literature on the subject, five or six extensive papers, as well as several brief notes, have appeared within the last three years; it seems unnecessary to give a list of these here, as they are fully recorded by Mr. Ross A. Gortner.[1] The general conclusion from these various studies is that the development of the color is due to the oxidation of the manganese in the glass, although the exact mechanism of the change is not understood. Whether the tints produced in a great variety of substances by exposure to radium preparations are of the same character as those brought about by sunlight and ultra-violet light in glasses has never been definitely ascertained; but it appears more probable that they belong in the class of colloid colors, such as the red of glass containing metallic gold, the blue of sodium chloride heated in sodium vapor, and, possibly, the violet of the amethyst-quartz found in nature.

EDGAR T. WHERRY
PHILADELPHIA, PA.

THE ITALIAN ARCHIVES OF BIOLOGY

TO THE EDITOR OF SCIENCE: The publication of the *Archives Italiennes de Biologie*, founded by Professor Mosso, after having reached forty-eight volumes and its twenty-fifth year met with a grave interruption in its career, owing to the strike of the typographers at Turin, and it has been found necessary to make new arrangements for the continuation of the journal. The next number is shortly to be issued under the auspices of the new administration. The publication remains, as in the past, under the direction of Professor Angelo Mosso, with Professor V. Aducco and Professor U. Mosso as coeditors. It will still have the cooperation of biologists in sundry Italian universities. The original articles and summaries published in the *Archives* represent faithfully the progress of biology each year in Italy. The appearance of the journal will be improved, and the editors make an appeal for increased support from America. The publication has acquired a high standing and ought certainly to be among the journals taken by every university in the country. The subscription price is 40 frs. for the two annual volumes. Subscriptions should be sent to the

[1] "Some Effects of Sunlight on Colorless Glass," *American Chemical Journal*, Vol. 39, 1908, 157–162.

Administration des Archives Italiennes de Biologie, Via Acquarone, Genova, Italy.

Charles S. Minot
Harvard Medical School,
May 29, 1908

SPECIAL ARTICLES

AN INTERPRETATION OF ELEMENTARY SPECIES

The original idea which led to the development of the theory of so-called elementary species is found in Darwin's gemmules. Existence of these gemmules was proposed to explain the supposed transmission of acquired characters. Weismann, acting on Darwin's idea as a suggestion, developed a very elaborate theory of heredity. To consider the relation of Weismann's philosophy to the subject in hand would take us too far from our present object, though this relation is important. De Vries, going directly back to Darwin and doing away with that part of Darwin's theory which postulated the migration of gemmules of the various cells of the body to the germ cells and assuming that the germ plasm is composed of these gemmules—or as de Vries calls them, pangens, has developed a very elaborate theory, not only of heredity, but also of evolution, based on the assumption that the individual is merely an assemblage of parts, each of which constitutes an hereditary character and each of which develops from a particular pangens in the original germ plasm of the fertilized egg. He conceives a definite species to be made up of a definite number of these hereditary characters. The addition of a new kind of pangens to the germ plasm causes the developed organism to differ more or less from other individuals which preceded it. If this difference relates to a single pangens, then the new and modified form of the organism is looked upon as an elementary species. It differs from its congeners by an elementary difference. The ordinary species may contain within it a large number of elementary species, each differing from those nearest related to it by the possession of a single pangens not possessed by its nearest relatives.

The work of Nilsson in Europe and of Shull in this country have been considered as strengthening the idea of elementary species. Nilsson has been able to obtain varieties of wheat and other plants that may be assumed to be absolutely uniform except for such differences as are caused by environment. Some of the distinct strains differ very little, but this difference is absolutely constant, and the different individuals within one of the elementary species are as like each other as so-called identical twins. They offer no further chance of improvement by selection. Shull has, in like manner, obtained supposedly elementary species of corn which breed true, the various individuals of a given strain being as much alike as identical twins. He was led to look upon a corn field as simply a heterogeneous collection of these elementary species and hybrids between them.

These so-called elementary species can easily be accounted for on the old Darwinian idea of gradual evolution, as will be shown below. They are, therefore, in no wise a confirmation of the pangens theory of de Vries. The demonstration is as follows: Let A, Table I., represent a Mendelian character which is more or less variable in the different individuals in which it appears, these differences being hereditary. Let B and C represent other Mendelian characters similarly variable. The variations in these characters may have come about gradually, as Darwin supposed variation to occur, or they may have come about in any other manner. Suppose A^1 represents the first character as it appears in a particular homozygous individual. A^2 may represent this same character in another homozygous individual, the difference between A^1 and A^2 being so slight as not to be certainly discernible. In like manner A^3 differs from A^2 so slightly that the two can not be certainly distinguished, but A^3 differs from A^1 sufficiently to be distinguished. So with the other A's. Any one of them in the series from A^1 to A^{10} differs so slightly from adjacent A's as not to be certainly distinguishable from them, but may be distinguished with more and more certainty as we recede from the selected A in the series. The exponents of B and C have