the commemoration of the dead; but the fact that the "cove," or holy of holies, in the centre of the northern circle, faced the sun when rising at midsummer has been regarded as indicating sun-worship to have been the chief purpose of this vast monument, which was in all respects so suitable for a place of assembly for a tribe or nation.

A short distance to the north of the main road from Marlborough to Abury are the remains of a dolmen called the "Devil's Den," and there is another at Rockwell, four miles northwest from Marlborough and two miles northeast from Abury. There was also a circle at Winterbourne Basset, four miles north from Abury, but it is not worth the trouble of a visit, as only three or four stones remain.

## PHYSIOLOGICAL CONTRIBUTIONS FROM MISSOURI BOTANICAL GARDEN. I.

BY J. CHRISTIAN BAY, MISSOURI BOTANICAL GARDEN, ST. LOUIS, MO.

### THE PLANT CELL.

IN the early part of this year, Professor von Sachs, of Wuerzburg, published a paper on the theory of cells: Beitraege zur Zellentheorie in "Flora," 1892, Heft 1, pp. 57–64. The leading thought of this publication seems to me to form, when combined with the following suggestions, the key and basis for deductions from the very long and interesting series of facts which forms the results of investigations of the later years in the functions of vegetable cells, both mechanical and physiological.

It is not difficult to trace how, even since the epoch of natural philosophy ("die Naturphilosophie"), the science of vegetable physiology has been in want of a solid foundation, a base, upon which the results of investigations in the phenomena of the life of vegetable cells could be firmly built. In the *Botanische Zeitung* a lance was in vain broken for the old theory; somebody then in vain put out the question, what Schleiden would give us instead of the old natural philosophy. Schleiden made no answer, because he had none to give.

The physiology of the plant cell having had since that time no leading exponent is, I suppose, the reason why at present that science merely consists of a series of very interesting, suggestive facts, but without the necessary conjunction with regard to points of view leading to general results.

A great many prominent men have devoted their lives to the study of vegetable cells, and we must allow that botany has now progressed as far as zoölogy, but only with regard to the accumulation of facts, in animal biology the cellular physiology of Virchow, dating from 1858, has arrived at a very high stage of development. Therefore, when thinking of the construction of a comparative physiology of animals and plants, it will be a most thankworthy task to collect all of the thrown facts concerning the physiology (qua biology) of the plant cell and arrange them from a general point of view.

The reason why the botanical part of cellular science has not brought forth general results during this long period is also to be sought in the definition of the cell body in botany. Very few physiologists would allow that the plant cell as well as the animal cell is an organism. Still this definition is to be looked at as a necessary foundation for a clear perception of the phenomena of botanical cellular physiology, both mechanical and chemical. As far back as 1848, one of the most prominent physiologists, N. Pringsheim (De forma et incremento stratorum crassiorum in plantarum cellula observationes quaedam novae. Halae, 1848, p. 38.) reminded us that "cellula est individuum," Hilger and Husemann, Weiss, and A. Zimmermann have told us almost the same, but still we find such definitions as "Grundorgan" (Frank), "Elementargebilde," "Formelemente" (G. Haberlandt). In his excellent "Lectures," Vines calls the plant cell "the physical basis of life." It must be remembered that Huxley ("Physical Basis of Life") only spoke of the protoplasm as the bearer of life. And Huxley himself, when he gave this most ingenious definition, did not see in protoplasm the *physiological basis of life.* Life never rested on a physical basis, nor consisted in physical matters alone.

Nobody will doubt whether a yeast cell is an organism or not.

Professor R. Pedersen, of Copenhagen, for six years my teacher in physiology, first mentioned these facts to me in the winter of 1891, acknowledging the results of this consideration for the evolution of cell theory in botany. Never this explanation was said with regard to the fact that said definition subsequently would form the key to cellular physiology in botany and, I may add, to comparative physiology of animals and plants.

The question is of considerable importance, because the accumulated facts now need a basis. The proposition of Sachs in his recent paper must be said to have come in due time. Yet it evidently ought to be connected with the given definition of the cell. Now we shall be able to arrange the facts in a system, see where vacant spaces may be, and fill up the voids, but up to the present time we were unable to do so.

Taking the "energids" as a basis of vegetable life, Sachs found "a real unity as a basis for the plant body," when we allow an energid to be "one nucleus with that protoplasm which surrounds it and which is commanded by the same nucleus." Then, looking forward, we shall see as one of the necessary results that the cell, often containing more than one nucleus, is really an organism, never an organ. Even without this deduction we may acknowledge the cell as an organism, because it acts as an organism.

Mechanics not being life, life is not mechanics; physiology alone is the science of the functions of life. Therefore, to understand the latter we must find a good physiological foundation for it.

By this explanation I hope to have been able to show that investigations in the life of the plant cell ought to be brought into another trace in the future. More than usual plant physiologists must be aware that they want — as Sachs says — "a scientific language, according to the true scientific idea."

## LETTERS TO THE EDITOR.

*** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

*On request in advance, one hundred copies of the number containing his communication will be furnished free to any correspondent.*

*The editor will be glad to publish any queries consonant with the character of the journal.*

### An Alleged Mongoloid Race in Europe.

ALTHOUGH it is not usual, and often impracticable, for writers to reply directly to the various criticisms passed upon their books, yet, as an interested reader of *Science*, I may perhaps be allowed to say some words with regard to a review of my "Testimony of Tradition," contributed to your issue of Feb. 10 (p. 82), which I have not had an opportunity of seeing until to-day. This I desire to do in order to remove more than one misapprehension of my meaning in the work reviewed.

"The very slender basis for the whole theory," says the reviewer, "is the syllable *Fin.*" In this he is greatly mistaken. Linguistic comparisons in this direction are certainly made, and considerable stress laid upon them, but these are entirely subsidiary to the important statements quoted in the first chapter. Briefly, these are to this effect: Wallace, a clergyman in Orkney during the second half of the seventeenth century, states that "Finn-men" were at that time occasionally seen off the coasts of Orkney, each "Finn-man" being the solitary occupant of a small skiff. In particular, he specifies the years 1682 and 1684, and another writer (Brand), who confirms his account, gives instances in or about the years 1700 and 1701. Their skin-boats, and the dress and usages of the people themselves, as described by these writers, identify them at once with Eskimoes, i.e., an Eskimo-like race. Of this there can be no reasonable doubt. Both writers state that one of their skin-boats was then preserved "as a rarity" in the Hall of the Edinburgh College of Physicians, and it is added that another specimen was preserved in the parish church of Burray, Orkney. The former statement is confirmed by an entry of the year 1696 in the minute-book of the Edinburgh College of Physicians, which I copied from the original writing and published in my book (p. 10). The writer first quoted (Wallace)