that galls are normal products of the plants on which they grow, and that these galls, by an evolution of their protoplasm, eventually give birth to animal life. This seems to "out-evolutionize" the most radical evolutionist.

Mr. Austin describes two new genera of mosses, dedicating one to Capt. J. Donnell Smith and the other to Mr. Eugene A. Rau. Considerable space is devoted to botanical news, a department that could be made exceedingly interesting and important in the organ of a large club so centrally located as the Torrey club. We note with pleasure that Mr. W. R. Gerard has been elected assistant editor of the Bulletin.

The Function of Chlorophyll.—One of the most important recent contributions to physiological botany is contained in a recent communication to the Berlin Academy of Sciences, by Dr. Pringsheim, which appears to throw considerable fresh light on the function of chlorophyll in the life of the plant.

Having been led by previous researches to the conclusion that important results might be obtained by the use of intense light, he combined an apparatus by which the object under view should be brightly and constantly illuminated by a strong lens and a heliostat. If in this way an object containing chlorophyll —a moss leaf, fern-prothalium, chara, conferva, or thin section of a leaf of a phanerogam be observed, it is seen that great changes are produced in a period varying from three to six or more minutes.

The first and most striking result is the complete decomposition of the chlorophyll, so that in a few minutes the object appears as if it had been lying for some days in strong alcohol. Although, however, the green color has disappeared, the corpuscles retain their structure essentially unaltered. The change then gradually extends to the other constituents of the cell; the circulation of the protoplasm is arrested; the threads of protoplasm are ruptured and the nucleus displaced; the primordial utricle contracts and becomes permeable to coloring matters; the turgidity of the cell ceases; and the cell presents, in short, all the phenomena of death.

That these effects are not due to the action of the high temperature to which the cell is exposed under these circumstances is shown by the fact that they are produced by all the different parts of the visible spectrum. The result is the same whether the light has previously passed through a red solution of iodine in carbon bisulphide, through a blue ammoniacal solution of cupric oxide, or through a green solution of cupric chloride. If the carbon bisulphide solution of iodine be so concentrated that only rays of a greater wave-length than 0.00061 mm. can pass through it, these effects are not produced, although about eighty per cent. of the heat of white sunlight is transmitted. On the other hand, if the ammoniacal solution of cupric oxide be so concentrated that the whole of the rays of a less wave length than 0.00051 mm. are absorbed, a rapid and powerful effect is produced, although the amount of heat that passes is very small. It is thus seen that the phenomena in question are not the result of heat.

The next point determined by Dr. Pringsheim is that the effects are not produced in an atmosphere devoid of oxygen. This was the case whether the oxygen was replaced by pure hydrogen or by a mixture of hydrogen and carbon dioxide; while the removal of the carbon dioxide from atmospheric air was altogether without effect on the phenomena. The conclusion drawn is that the decomposition of chlorophyll in the living plants is a process of combustion which is influenced and promoted by the action of light, and which is not related to the decomposition of carbon dioxide by the plant. When the green color of the chlorophyll-grains has been partially destroyed, it cannot be restored, even though the cell continues to live; from which it is inferred that the result is not a normal physiological, but a pathological effect. No substance was found in the cells which might be regarded as the product of the decomposition of the chlorophyll, nor was any oil or starch detected in the etiolated cell, nor any formation of grape sugar or dextrine. The assumption is therefore that the products of decomposition are given off in the gaseous form.

The conclusion is drawn that the decomposition produced in the protoplasm, and in the other colorless cell contents, is the direct effect of the photochemical action of light. That it is not due to the injurious influence of the products of decomposition of the coloring matter of the chlorophyll is shown by the fact that it takes place equally in cells destitute of chlorophyll, such as the hairs on the filaments of *Tradescantia*, the stinging hairs of the nettle, &c. It is, on the other hand, dependent on the presence of the oxygen, or is a phenomenon of combustion.

The results of a variety of experiments leads Dr. Pringsheim to the important and interesting conclusion that the chlorophyll acts as a protective substance to the protoplasm against the injurious influence of light, diminishing the amount of combustion, or, in other words, acting as a regulator of respiration.

He then proceeds to investigate what are the substances which become oxidized in the process of respiration. In every cell, without exception, that contains chlorophyll, Pringsheim finds a substance that can be extracted by immersion in dilute hydrochloric acid for from twelve to twenty-four hours, to which he gives the name *hypochlorin* or *hypochromyl*, and which he believes to be the primary product of the assimilation of the chlorophyll. It occurs in the form of minute viscid drops or masses of a semi-fluid consistency, which gradually change into long red-brown imperfectly crystalline needles. It is soluble in alcohol, ether, turpentine and benzol, but insoluble in water and in a solution of sodium chloride. It becomes gradually oxidized on exposure to an imperfectly crystalline resinous substance. It is probably an ethereal oil, and an invariable accompaniment of the coloring substance of chlorophyll, and even more universally distributed than starch or oil. It has not yet been detected in those plants which do not contain true green chlorophyll, such as the Phycochromaceæ, Diatomaceæ, Fucaceæ and Florideæ. Starch and oil appear to be reserve substances produced by the oxidization of the hypochlorin caused by light, it being the most readily oxidizable constituent of the cell, more so even than chlorophyll itself.

That the hypochlorin—present in variable quantity in every chlorophyll grain under normal circumstances—is subject to continual increase and decrease, may be proved without difficulty. All comparative observations on chlorophyll grains in younger and in older conditions, point unmistakably to the conclusion that the collection and increase of the starch enclosed in the ground substance of the chlorophyll, goes on *pari passu* with the decrease of the hypochlorin. In dark, the hypochlorin, which does not take any direct part in transport of food materials, is more permanent than starch; and this fact again is in agreement with the conclusion that its transformation in the cell into more highly oxidized bodies is hindered by the increased respiration in light.

In the facts here detailed, and the conclusions derived from them, Dr. Pringsheim believes that an entirely new light is thrown on the cause of the well-known fact that assimilation takes place only in those cells of the plant which contain chlorophyll. This substance acts universally as a moderator of respiration by its absorptive influence on light, and hence allows the opposite phenomena of respiration and elimination of carbon dioxide to go on in those cells which contain it. A more detailed account of the experiments and results is promised by the author in a future paper.—ALFRED W. BENNETT, *in Am. Naturalist.*

PTERIS AQUILINA, VAR CAUDATA, AGAIN.—Since my note in the GAZETTE on the huge specimen of this species sent from Florida, I have received the following note from Mr. White: "In compliance with your request I measured a *Pteris* as follows: Stipe 6 ft.; first pair of divisions abortive; second pair 8 ft. from ground, and each division 5 ft. (making a spread of 10 ft., G. E. D.); third pair, spread 8 ft. and the next pair 6 ft.: total height 14½ ft. The primary divisions were 2 ft. apart until the last mentioned pair which were 1½ ft., making a spread of 6 ft. at a height of 11½ ft. from the ground. Almost aborescent, eh?"

It will be seen from this that I probably underestimated the breadth of the specimen which I described, and that the dimensions of the specimens measured by Mr. White exceed anything heretofore recorded anywhere.—GEO. E. DAVENPORT.

AMERICAN MONTHLY MICROSCOPICAL JOURNAL.—This a continuation of the *Quarterly* and is worthy the support of all interested in the work of the microscope. It is a journal of 20 pages, is illustrated, and costs but one dollar per year. The name of the editor, Romyn Hitchcock, gives an assurance of careful. conscientious work.

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