This article was downloaded by: [University of Alberta]
On: 26 April 2015, At: 09:50
Publisher: Taylor & Francis
Informa Ltd Registered in England and Wales Registered Number:
1072954 Registered office: Mortimer House, 37-41 Mortimer Street,
London W1T 3JH, UK

Transactions of the Botanical Society of Edinburgh

Publication details, including instructions for authors and subscription information:

<http://www.tandfonline.com/loi/tped18>

Luminosity In Plants

Miss Bertha Chandler M.A.

Published online: 29 Nov 2010.

To cite this article: Miss Bertha Chandler M.A. (1908) Luminosity In Plants, Transactions of the Botanical Society of Edinburgh, 23:1-4, 333-337, DOI: [10.1080/03746600809469178](https://doi.org/10.1080/03746600809469178)

To link to this article: <http://dx.doi.org/10.1080/03746600809469178>

PLEASE SCROLL DOWN FOR ARTICLE

Taylor & Francis makes every effort to ensure the accuracy of all the information (the "Content") contained in the publications on our platform. However, Taylor & Francis, our agents, and our licensors make no representations or warranties whatsoever as to the accuracy, completeness, or suitability for any purpose of the Content. Any opinions and views expressed in this publication are the opinions and views of the authors, and are not the views of or endorsed by Taylor & Francis. The accuracy of the Content should not be relied upon and should be independently verified with primary sources of information. Taylor and Francis shall not be liable for any losses, actions, claims, proceedings, demands, costs, expenses, damages, and other liabilities whatsoever or howsoever caused arising directly or indirectly in connection with, in relation to or arising out of the use of the Content.

This article may be used for research, teaching, and private study purposes. Any substantial or systematic reproduction, redistribution, reselling, loan, sub-licensing, systematic supply, or distribution in any form to anyone is expressly forbidden. Terms & Conditions of access and use can be found at <http://www.tandfonline.com/page/terms-and-conditions>

MEETING OF THE SOCIETY,

March 12, 1908.

J. RUTHERFORD HILL, Esq., President, in the Chair.

Mr. J. N. ZUTSHI was elected a Non-Resident Fellow.

The following communication was read:—

LUMINOSITY IN PLANTS. By Miss BERTHA CHANDLER, M.A.
Communicated by Dr. A. W. BORTHWICK.

The subject of luminosity in plants is an interesting one, from the very obscurity in which the subject is still wrapped. Comparatively speaking, not much research has been done in connection with the subject, and the cause and significance of this phenomenon in the majority of plants still remains a mystery. Investigations that have been carried out, however, have revealed much that is interesting.

First of all considering the facts, and then the theories, we come first to the occurrence of this phenomenon in the higher plants.

The so-called luminosity of the flowering plants does not really belong to this class of phenomena, but is possibly due to St. Elmo's fire, a species of electrical phenomenon depending on the condition of the atmosphere. But the cases observed were formerly explained as luminosity, and are interesting historically. The daughter of Linnæus is said to have been the first to remark the light issuing from a flowering plant. She noticed luminous radiations being emitted from a group of nasturtiums (*Tropæolum majus*). Other observers, too, have remarked the same phenomenon, and, curiously enough, almost without exception, in yellow, orange, and occasionally in red flowers, such for example as the sunflower (*Helianthus*)—garden marigold (*Calendula*)—two species of *Tagetes*, which the French call Rose d'Inde and Œillet d'Inde. Dr. Phipson has called attention to this curious fact, that in almost all the cases noted of phosphorescence, not only in the plant world, but even in the animal

and mineral kingdoms, whether we take into consideration the colour of the light produced or the substance which shines, yellow and orange tints seem to predominate, and appear in some way connected with the phenomenon. Professor Haggern, the Swedish naturalist, studied the question of luminosity in flowering plants very carefully. He observed the phenomenon more or less marked in the common marigold, garden nasturtium, the orange lily, and the French and African marigold. Thinking that the phenomena might be due to phosphorescent insects, he examined the flowers with the microscope, but no such organisms were found. The rapidity of the flash, however, led him to believe that the phenomenon was due to electricity, the pollen, when freed from the anthers, being electrified and then alighting on the petals, from which the light was emitted.

The Swedish botanist, M. Fries, also observed the phenomenon of luminosity in the poppy. Thinking his eyes deceived him, he called others, and without an exception all remarked the phenomenon. One can scarcely believe that the case observed and others similar were optical illusions, as Pfeffer suggests they might have been; but that these phenomena are in some way connected with the condition of the atmosphere and with electricity is undoubted, since all the phenomena observed took place on warm, sultry evenings.

According to Mornay and Martius, the latex of certain *Euphorbias* is phosphorescent. Pfeffer suggests that this is due to oxidatory photo-chemical changes on exposure to the air, or perhaps that the latex is infected with luminous bacteria. Evidently the phenomenon has not been thoroughly worked out, but research in this direction would be interesting.

Another interesting case of luminosity in higher plants is that of the potato. It is said that in a state of decomposition it emits a bright light. The cause is most probably identical with that of luminous decaying wood, the luminosity of which is due to fungi. The fact of the luminosity of decomposing potatoes was remarked by an officer on guard at Strasburg, who thought the barracks were on fire in consequence of the light emitted from a cellar full of potatoes.

Though the facts are interesting, not really much importance can be attached to the so-called luminosity of higher plants. It is among the lower plants, especially among the fungi and bacteria, that the phenomenon is more striking.

A little moss, *Schistostega osmundacea*, the protonema of which gives forth a faint emerald-green light, was supposed formerly to be luminous, but it has since been clearly shown that the phenomenon is one of reflected light. Leaving this plant, therefore, out of the question, also the wonderful iridescence of many sea-weeds, Professor Molisch says that phosphorescence in the plant world may be said to be confined to the fungi—that is to say, bacteria and mycelial fungi.

Let us first consider fungi. Many agarics exhibit the phenomenon of luminosity. *Agaricus melleus* is one which is most commonly met with, perhaps, but there are other species, e.g. *A. olearius*, growing at the foot of olive trees in Italy, *A. noctilucens*, *Gardneri*, etc. M. Delille and Fabre and Gardner have studied these agarics in some detail. Another fungus which is luminous, common in dark, damp mines, is *Rhizomorpha subterranea*. The effect of the light in the mines is said to be very pretty, but nowhere perhaps is it more beautiful than in the mines of Hesse in N. Germany.

The phosphorescence of decaying wood has been shown to be due to the presence of fungi. Perhaps the latest work in this direction has been done by Professor Molisch of Prague. He also states that he found decaying leaves quite luminous, e.g. those of oak and beech. The luminosity is not always due to the same cause. There is a byssoid fungus which is said to be commonly found on old willows—*Thelephora caerulea*, so called from the blue colour of the mature plant. *Xylaria hypoxylon* is also responsible for the phenomenon. Bockman has shown that dampness is necessary for the luminosity of decayed wood, and made many interesting experiments in connection with the subject.

To pass on to the luminosity of bacteria: considerable work has been done in this connection, especially in late years, by Molisch and by Beyerinck. The former has investigated the cause of phosphorescence in fish and meat, and has shown that the phenomenon (which is of so common

a household occurrence, though perhaps luminous meat is not so familiar to us as luminous fish) is due to the presence of bacteria, usually *B. phosphoreum*. These phosphorescent bacteria, according to Fischer, are almost exclusively salt-water forms, and hence the readiness with which moist fish become luminous. Professor Molisch induced luminosity in meat by leaving it in a solution of salt in a cool place for a few days. A culture of phosphorescent bacteria can be made in a 2·3 per cent. NaCl solution, besides the ordinary salts and peptone, and also some source of carbon, such as sugar, etc.

The same author in his work on Luminosity, has suggested luminous bacteria as a source of illumination. By inoculating glass flasks containing a suitable culture medium with phosphorescent bacteria, he obtained a "bacterial lamp" with which it was quite possible for an observer at a distance of one or two meters to read a thermometer or see the time of a watch. It has been suggested that such a lamp might be used in a powder magazine, or for attracting fish, as the flask might be sealed up and lowered into the water, since dead luminous flounders have been successfully used by fishermen as bait. Professor Molisch says that to R. Dubois is due the invention of this bacterial lamp.

Beyerinck has done much interesting work in connection with phosphorescent bacteria. He has shown that they can be used as an extremely delicate test for oxygen, in the smallest trace of which these bacteria become phosphorescent. He has also used them for detecting the presence of an enzyme.

Let us now briefly consider the theories that have been suggested as an explanation of the phenomenon of luminosity in plants. That luminosity is in some measure connected with respiration is undoubtedly the case, for, generally speaking, if the oxygen supply be cut off, luminosity ceases. That it does not, however, vary directly with respiration is proved by the fact that respiration increases up to a maximum temperature, whereas luminosity ceases above a rather lower optimum temperature. Masee maintains that luminosity is a specific property of the protoplasm and not simply due to oxidation. There seems, however, far more in favour of Pfeffer's view that certain substances are probably produced

during the metabolism, or more especially the respiratory katabolism of the cell, the slow oxidation of which gives rise to light, or whose action on other substances also in the cell, gives rise to light. Luminosity, according to this view, therefore, is a chemical production of light, not a specific property of the living protoplasm. Pfeffer's view is closely allied to Dubois' theory for the luminosity of insects and fishes, though no substances, such as luciferin, and luciferase, which is of the nature of an enzyme, have been isolated in the case of plants, as in the case of *Pholas dactylus*.

Of what significance luminosity is to plants it is difficult to say. It may not be of any direct use, except as a means of getting rid of waste products by burning them, so to speak. But since luminosity in fishes and insects seems to possess a significance it seems natural to search for the same in the plant world. Further research may reveal much, however, that is now incomprehensible.

Mr. JAMES WHYTOCK showed a series of cut flowers from Dalkeith Palace Gardens.

Dr. R. STEWART MACDOUGALL exhibited (1) a section of Pier Prop from Felixstowe ruined by *Teredo*; (2) Branch of apple tunnelled by caterpillar of *Zeuzera cæsculi*, with caterpillar *in situ* from Essex.

Dr. A. W. BORTHWICK exhibited a series of specimens of trees and shrubs in various stages.

Mr. R. L. HARROW showed the following plants in flower from the Royal Botanic Garden:—*Corydalis bulbosa*, var. *densiflora*, *Galanthus nivalis*, var. *poculiformis*, *Iris histrioides*, *Iris* × *per-sind*, *Iris* × *sind-per*, *Iris reticulata*, var. *Krelagei*, *Iris sophonensis*, *Primula malacoides*, *Ranunculus Ficaria* (with mottled leaves), *Saxifraga apiculata*, *S. Boydii*, *S. Boydii*, *Fulldonside* var., *S. juniperifolia*, *S. oppositifolia*, *S. Paulineæ*, *S. Petraschii*, *S. scardica*.