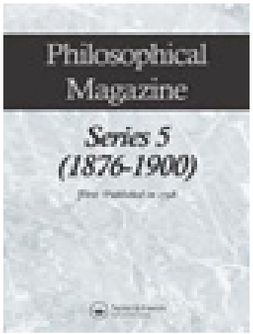

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on the electromotive action of illuminated selenium, discovered by Mr. Fritts of New York

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cellent results; I do not know within what limits of pressure it can be employed.

The measurement of the volumes of gas has been made by various methods, one of which, based on the use of electrical currents, was communicated to me by Professor Tait of Edinburgh; I shall describe it in my next communication.—*Comptes Rendus*, March 2, 1885.

ON THE ELECTROMOTIVE ACTION OF ILLUMINATED SELENIUM, DISCOVERED BY MR. FRITTS OF NEW YORK. BY WERNER SIEMENS.

Mr. Fritts, of New York, sent me last summer a description of his method of preparing selenium plates sensitive to light, which differs from mine in many essential points, and he also sent some of the plates he had prepared. Unlike mine *, they do not consist of parallel platinum wires which are imbedded in a thin layer of selenium, but of a thin homogeneous layer of selenium which is spread on a metal plate, and after being heated, to convert the amorphous into crystalline selenium, is coated with fine gold-leaf. Mr. Fritts found that the green light which has passed through the gold leaf increases the electrical conductivity of the selenium which it traverses. In fact the conductivity of the selenium plate between the gold-leaf and the metal base is increased from 20 to 200 times as much, when the sun's rays fall vertically upon it. And even when illuminated by diffused light, the action is greater with Mr. Fritts's preparation than with my own. One of the plates sent exhibited no sensitiveness to light, but had another and highly remarkable property, namely, that a galvanometer interposed between the gold-leaf and the base plate indicates the existence of an electrical current in the same direction as the motion of the light, as long as the gold-leaf is illuminated. I imagined at first that this current was not permanent, but resembled a polarization-current which only continued until the molecular modification of the selenium by the illumination was complete; and my first experiment appeared to support this assumption. More recent and more thorough experiments have convinced me that this supposition was erroneous. We are here dealing with a phenomenon which is of the greatest scientific importance. My experiments have shown that when the gold-leaf is illuminated, a difference of potential is established, which apparently is proportional to the light and which lasts as long as the illumination. Obscure thermal rays do not act as electromotors, and accordingly the assumption that the action is thermoelectric is excluded. Mr. Fritts assumes that the waves of light which penetrate the selenium are directly converted into electrical currents, and this view is

* *Monatsber. der Berl. Akad. der Wissenschaften*, May 13, 1875, and Jun 7, 1877.

favoured by the proportionality of the strength of the current to the intensity of light. This resulted approximately from the experiments collated in the following table:—

Intensity of light in standard candles ...	6·4	9·9	12·8	16·8
Strength of current ...	18	30	40	48
Quotient	2·8	3	3·1	2·8

The luminosity was determined by means of a Bunsen's photometer, and the strength of the current was determined by the deflection of a delicate reflecting-galvanometer.

When the gold-leaf was exposed to illumination from the south-east side of the unclouded sky, while the sun itself was hidden by adjacent high buildings, the measurements given in the following table were obtained.

Time of observation...	h m 9 37	h m 10 5	h m 10 30	h m 11 0	h m 11 35	h m 12	h m 12 30	h m 1 0	h m 1 30	h m 2 0	h m 2 30	h m 3 0
Deflection of the galvanometer.	190	196	209	223	250	250	244	245	249	228	188	173
Time	3·30	4										
Deflection ...	172	108										

It follows from this that the electromotive force of the selenium plate increased pretty regularly from the morning at 9.30 to mid-day at 11.35, and then remained constant with some variations, after which it decreased pretty regularly to 3 o'clock.

Mr. Fritts is unable to offer any explanation as to the reason why some plates become better conductors, and some act as electromotors; he complains of the uncertainty in the preparation of the selenium plates, the properties of which cannot be foreseen, and he gives various methods of dealing with them, by which plates which are often inactive may be used. More thorough investigations will therefore be necessary to establish what is due to the electromotive action of light on many selenium plates. Nevertheless the existence of a single selenium plate with the properties described is a fact of the greatest scientific importance, for here we meet for the first time with an instance of the direct conversion of the energy of light into electrical energy.—*Sitzungsberichte der Akad. der Wissen. zu Berlin*, Feb. 12, 1885.