SCIENCE.

FRIDAY, OCTOBER 12, 1883.

HERMANN MÜLLER.[1]

THE sad news has just reached this country of the death of Professor Müller, at Prad, on the 25th of August.

Since the death of Mr. Darwin, Dr. Müller has occupied the position of most prominence among students of the mutual relations between flowers and insects, — a study which, in the last decade, has contributed as much as any branch of biology to the substantiation of the main points of adaptive evolution. Müller was born at Mühlberg, Sept. 23, 1829, and was a younger brother of the well-known Brazilian naturalist, Fritz Müller, much of whose work has passed through his hands before its publication.

Between 1848 and 1852 he studied at the universities of Halle and Berlin, devoting himself to natural history. In the latter year he passed the Oberlehrer examinations, and served his novitiate in the Berlin realschule. In 1854 he received his first appointment as teacher in the school at Schwerin, and the following year took the natural sciences in the realschule at Lippstadt, where he remained as teacher and director until his death.

Previously to the attainment of his degree, Dr. Müller had shown considerable zeal in natural history explorations, which were continued, in 1855, in the vicinity of Krain, where he did some especially interesting work on the blind insects found in the caves at this place, the results of his studies appearing in the *Stettiner entomologische zeitschrift* for 1856–57. After settling at Lippstadt, he gave particular attention to botany and entomology, working up, in particular, the local phenogamic flora, and later the mosses of Westphalia, sets of which were distributed by him between 1864 and 1866.

About this time the classical work of Darwin on the fertilization of orchids by insects directed his attention to the pollination of flowers, — a subject, which, neglected since the time of Sprengel, was then attracting several biologists. His familiarity with Westphalian plants and insects fitted him especially for work of this nature; and his first contributions[2] showed that he was also possessed of the requisite powers of observation and interpretation.

From this time on, his leisure was given to field-work in this specialty, many of his summers being spent in the Alps. While Delpino, Hildebrand, and others were not slow to follow in the steps of Mr. Darwin, showing, both from the structure of flowers and the results of many careful experiments, how they must *a priori* be fertilized, Müller observed, in addition, how their pollination is actually effected; and our knowledge of the degree to which the reciprocal adaptations of flowers and their visitors extends may be set down as in large part the result of his labors.

In the past ten years, numerous papers from

[1] The portrait on this page is engraved from a photograph by Ophoven of Lippstadt, kindly furnished by Prof. William Trelease of the University of Wisconsin.

[2] Beobachtungen an Westfälischen orchideen (*Verhandl. naturh. vêr. Preuss. Rheinl. u. Westfälens*, 1868) and Anwendung der Darwinsche lehre auf bienen (*ibid.*, 1872).

his pen have appeared in the *Botanische zeitung*, *Bienen zeitung*, *Kosmos*, *Nature*, etc., while, as editor of the department of Justs' *Jahresbericht*, relating to pollination and dissemination, he has contributed reviews of all of the more important publications bearing on his specialty. Beside these, he published two books, — Befruchtung der blumen durch insekten, und die gegenseitigen anpassungen beider (which appeared in 1873, served as the basis of a very instructive series of articles in *Nature*, and was largely drawn upon by Lubbock in the preparation of his little work on British wild-flowers, and which, supplemented by the more recent observations of its author, has lately been translated into English) ; and Alpenblumen, ihre befruchtung durch insekten und ihre anpassungen an dieselben (a volume of equal size, published in 1881, and, like its predecessor, filled with instructive facts).

From the first, Dr. Müller was a pronounced evolutionist, perhaps erring in too exclusive contemplation of a limited part of the evidence of derivation, and, like many others of the German school, inclined to push evolutionary logic to its ultimate if undemonstrable conclusion of materialism.

As a teacher he was most excellent, having the faculty, not only of imparting ideas to his pupils, but of inspiring their enthusiasm. In his specialty he was a careful observer, noting and accounting for many minute structural peculiarities in both flowers and insects, which, so long as their utility remained undiscovered, were explicable only by the theory of types in nature. So far as observation is concerned, his work is above criticism. As a rule, too, his inferences are correctly drawn, though the limitation of his studies to a small part of the world has at times rendered his enthusiasm over the biological significance of some supposed new adaptation, subject to the criticism of specialists previously familiar with the structure, if not with its meaning.

As a friend, Dr. Müller was always cordial, ever ready with encouragement and assistance for younger workers in the line of his specialty. He had, however, little patience with inaccuracy in observation, and, both publicly and in private, criticised errors with vigor; but, though his criticisms were sometimes severe, they were seldom unkind, and never unjust. By his death, biological science loses not only one of its most enthusiastic and able devotees, but also one, who, by the independent and thorough nature of his work, may be styled not inappropriately an epoch-maker.

THE USE OF THE SPECTROSCOPE IN METEOROLOGY.

In April last it was thought desirable to add to the regular meteorological observation made at the Shattuck observatory, Dartmouth college, the hygrometric indications of the spectroscope. The observations were made in accordance with the directions of J. Rand Capron in his 'Plea for the rain-band.' The instruments used were two direct vision spectroscopes: one a $3\frac{1}{2}$-inch 'vest-pocket' instrument of Hofmann's; the other 10 inches in length, and capable of separating the *D* lines with direct sunlight. The observations made in this way were found to be interesting, but unsatisfactory. The difficulty which an observer must always find in estimating confidently the degree of intensity of the absorption lines and bands with the widely varying lights of fair and cloudy weather, makes the arrangement of some method of measurement very desirable. After a few trials in other directions, the device described below was decided upon, and has proved satisfactory. It was thought that the absorption *lines* of aqueous vapor, seen with a spectroscope of rather high power, are better adapted to delicate measurement than the broad *band* seen with a low power. The small spectroscope used shows the dark band on the red side of the *D* line with great clearness; but the absorption lines are only visible when particularly strong. With the larger instrument, however, the spectrum is so elongated that the general darkening near *D* is hardly noticeable; while the two moisture lines to be found there are very prominent. The apparatus illustrated is designed to measure the variation in intensity of the darker line of this pair (the a of the *D* group of Janssen's map).

The only methods of measurement of the intensity of absorption lines, known to the writer, are those of Janssen and Gouy. The