ceptibly. From the law of continuity this must necessarily be the case in the transition of every solid into a gas, yet we are not aware of any definite experiments on this point.

The reciprocity of radiation and absorption is well illustrated by a comparison of the fluorescent and absorption spectrum of what the translator terms napthalin red; we presume rosaniline is meant. If the solar spectrum be projected upon a glass cell containing this liquid, the fluorescence exhibited in Fig. 6 (2) is seen. In the upper diagram is shown the absorption spectrum obtained by transmitting the solar spectrum through the same solution, and it will be clearer to the eye than it is in the diagram, that the three regions of strong fluorescence are in the same position as the three principal absorption bands. By employing a solution of proper strength, it will be found indeed that "every dark band in the absorption spectrum corresponds to a bright band in the fluorescing spectrum." (p. 190.)

The last diagram we give shows in an instructive manner the irrationality of the dispersion spectrum, by a comparison of the normal spectrum yielded by a diffraction grating with the ordinary prismatic spectrum (Fig. 7, 1). The last sentence in chap. 19, referring to this diagram, is badly translated, and certainly ought to be amended, for as it stands at present it is unintelligible.

We have said enough to show that Prof. Lommel's treatise is a useful contribution to the International Series, and is a book that can thoroughly be understood and enjoyed by any intelligent reader who may not have had any special scientific training. The familiar chromolithograph of different spectra which adorns the title-page of the volume has by this time lost its novelty and become wearisome. No book on chemistry, astronomy, or physics seems to be issued without it. Though the spectroscope is a wonderful and powerful instrument, yet the prominence of this subject is a little apt to throw equally valuable instruments into the background.

W. F. B.

DARWIN ON CLIMBING PLANTS

The Movements and Habits of Climbing Plants. By Chas. Darwin, M.A., F.R.S., &c. Second Edition, revised. With Illustrations. (London: J. Murray, 1875.)

THIS volume is a reprint of Mr. Darwin's well-known treatise on the habits of climbing plants, published in 1865 in the ninth volume of the "Journal of the Linnean Society," with such additions and corrections as the progress of knowledge since that time has rendered necessary. Although the subject had been investigated previously to that time by the German physiologists Palm and Von Mohl, it was Mr. Darwin's publication, describing many facts not previously recorded, that first introduced the remarkable phenomena connected with it to the notice of the general public. The phrase Climbing Plant is used by Mr. Darwin as a generic term for all those which, provided themselves with but weak stems that have no power of standing erect, avail themselves of the assistance of neighbouring plants for the purpose of raising their foliage and flowers to a considerable height from the ground. The plants included under this head are arranged in four divisions, according to the part that is modified in order to subserve this purpose: (1) Twining Plants (called in the first edition Spiral Twiners), in which the stem is the climbing organ; (2) Leaf-climbers, which climb by the aid of the petiole or some other portion of the leaf; (3) Tendril-bearers, by far the most numerous class, which are provided with tendrils specially contrived for this purpose; and (4) Hook and root-climbers, which climb by the aid of hooks on aërial roots, or merely scramble over other plants. In all these classes except the last, the mechanical means by which the climbing is effected is a sensitiveness and power of revolution possessed by the extremity of the stem or tendril, or by the petiole.

The origin of this peculiar power is one of the most interesting points of the inquiry. In some cases, as Passifloraceæ and Cucurbitaceæ, it is possessed by nearly or quite every species of the order; other orders, as Leguminosæ, include species belonging to two or three divisions of climbers, along with a large number which do not possess the power; while in others, as Compositæ, Rubiaceæ, Scrophulariaceæ, and Liliaceæ, it belongs to only a very few out of a large number of genera. From these facts, and the wide separation, on any system of natural classification, of the orders which contain climbing plants, Mr. Darwin draws the conclusion that "the capacity of revolving, on which most climbers depend, is inherent, though undeveloped, in almost every plant in the vegetable kingdom"—a conclusion which seems to us strongly confirmed by the fact that sensitiveness and a slight power of spontaneous motion are possessed by some parts of flowers where it is of no use for climbing purposes, as the flower-stalks of *Maurandia* and *Brassica Napus*; and by the remarkable observation of Fritz Müller—one of the most interesting additional notes in the present volume—that "the stems, whilst young, of an *Alisma* and of a *Linum*," which do not climb, "are continually performing slight movements to all points of the compass, like those of climbing plants."

These observations lead Mr. Darwin to a discussion of the nature of the difference between the so-called "spontaneous" power of motion of some plants and that possessed by animals, which he sums up as follows:—

"It has often been vaguely asserted that plants are distinguished from animals by not having the power of movement. It should rather be said that plants acquire and display this power only when it is of some advantage to them; this being of comparatively rare occurrence, as they are affixed to the ground, and food is brought to them by the air and rain."

In the present work Mr. Darwin makes ample reference to the light that has been thrown on the habits and movements of climbing plants by researches of a later date than the publication of the first edition, especially those carried out in the Würzburg Laboratory by De Vries and Sachs; and one of the most important of the additions is a paragraph wherein he expresses his partial dissent on one point from the conclusions of the last-named high authority. In his "Text-book of Botany," Sachs attributes all the movements of tendrils to rapid growth on the side opposite to that which becomes concave; these movements consisting of revolving nutation, the bending to and from the light and in opposition to gravity, those caused by touch, and spiral contraction. While

conceding this view with regard to all the other causes of movement, Mr. Darwin finds a difficulty in accepting it as regards movement caused by curvature from a touch, or what is ordinarily called sensitiveness. On this point he remarks that the movement of Revolving Nutation (Sachs's term for "the continuous self-bowing of a whole shoot successively to all points of the compass") differs from that due to touch, in so far that in some cases the two powers are acquired by the same tendril at different periods of growth; and the sensitive part of the tendril does not seem capable of nutation. A more important cause of hesitation is the extraordinary rapidity of the movement. Mr. Darwin has seen the extremity of a tendril of *Passiflora gracilis*, after being touched, distinctly bend in twenty-five seconds, and often in thirty seconds; and he doubts whether it is possible to believe in such rapidity of growth as would account for such movement. In reference to this we may simply remark that instances are on record of extraordinarily rapid growth—as in the case of the flower-stalk of *Vallisneria* to the extent of half an inch in an hour or more—even without any abnormal irritation.

The student will find in Mr. Darwin's work a *résumé* of everything known to the present date on this interesting and curious department of Vegetable Physiology.