

of the physiology of the heart. From it we gather, among other things, that it was Kronecker who discovered "that the heart is not irritable during systole"—denominated by Marey the refractory period; that Kronecker and his pupils found that the heart "ceases to beat if its contents are deprived of all stimulating properties"—from which fact we may infer "that there is no true automatism in the ventricle, but only intermittent action to a constant stimulus"; that "no other material enables the heart to beat except serum albumin, and to a very slight degree, serum globulin"; that Bowditch's law (minimal stimuli causing maximum pulsations, or in a word "all or nothing") holds good *without any exception*; that the rhythmicity of the flow through the arteries causes much more fluid to pass through them than when the flow is continuous; and that self-massage of the heart and vessels is an important factor in maintaining the efficiency of the circulatory mechanism. The last-named topic (self-massage of the heart, arteries, lymphatics, and veins) is also fully discussed by the author, who points out its important bearing on the nutritive integrity of the heart and the arterial wall. The author suspects that some may consider he has devoted too much space to the consideration of self-massage of the heart and vessels, and the conduction of stimuli in the heart. There is no doubt, however, that he is justified by the scant reference to these subjects in the text-books and by their practical importance.

In lectures ii. and iii., and in the appendix B, we have a very full and well-illustrated description of most of the instruments which have been devised for the measurement of blood-pressure in man for clinical purposes. The variety in construction shows us what a large amount of thought and ingenuity have been expended in devising them, so as to satisfy as much as possible clinical needs and accuracy. The introduction of such devices into clinical work has always been regarded with suspicion by physicians, who ever since the days of Herophylus have trusted with implicit faith to the infallibility of the *tactus eruditus*. In view of this natural distrust it is therefore of some importance, when discussing the claims of these innovations, to attach due weight to the objections which may be advanced to their adoption. The author does not, however, touch on this aspect of the clinical employment of blood-pressure apparatus. Probably this omission has arisen from want of space or the unsuitability of the subject for treatment in these lectures. We are therefore left to infer that he highly appreciates the advantages derived from the adoption of the methods now in use for the clinical measurement of blood-pressure, and that the practical value of these methods is amply justified by observation and experience; and there is no doubt that that is the verdict of the majority of those who have so far adopted these methods. The test of their usefulness is measured by the help and satisfaction they afford in the daily routine of practice rather than in the discovery of minor defects, which actually do not count for anything in disturbing the conclusions of the physician in clinical work. The author has, therefore, wisely devoted a

large portion of his lecture to this important subject, which more than any other has made it possible to apply our knowledge of the physiology of the circulation to the service of man.

To comment on the remaining lectures in which the author discusses in an instructive manner various diseases of the heart and their treatment would unduly extend this review, and introduce topics somewhat extraneous to the scope of *NATURE*.

But these remarks should not be closed without a reference to the profusion of excellent illustrations, which add greatly to the clear conception of the text, and the admirable indices, which facilitate easy and accurate reference.

JUSTUS VON LIEBIG.

Justus von Liebig. By Jacob Volhard. Band I., pp. xii+456. Band II., pp. viii+437. (Leipzig: J. A. Barth, 1909.) Price 24 marks.

THIRTY-FIVE years have passed since Liebig died, and we are at length presented with a biography worthy of the man and his work. At the time of his death innumerable articles on his life and achievements appeared in the newspapers and periodical press of practically every country in the world, and almost every known scientific society having relations with chemistry made reference to his splendid services, and to the irreparable loss which humanity had suffered by his decease.

Some of these, such as the memorable lecture of Hofmann, are among the classics of chemical biography. But a generation has had to come and go before the appearance of a work which would serve to fix for all time without question Liebig's true place in the history of the science he did so much to illumine and develop. The delay has not been without its compensations. Time is required to estimate the real value of such services as Liebig was able to render. The outcome of his work was not wholly apparent during his lifetime, or even in the years immediately following his death. Germany was barely a united nation in 1873. Although the seed of her supremacy in chemistry, and in many branches of the chemical arts, had been sown in the early Giessen days, and although he lived to see the signs of its abundance, Liebig died before the harvest was garnered. It is hardly garnered yet. The impetus which he gave to the study of chemistry still makes itself felt, not only in his native country, but throughout the world. To him, more than to any other man, is due the inception of the movement resulting in that development and extension of the industries dependent upon organic chemistry which is one of the most remarkable features of our times.

Liebig, a man of good fortune in his life, as the Romans say, is fortunate also in his biographer. With the possible exception of Hofmann, no more fitting choice could have been made than Prof. Volhard. The author and his subject were on terms of strong personal friendship, dating, indeed, from Dr. Volhard's early youth. He was, in fact, like a son of the house in Liebig's family. For some years Dr. Volhard

acted as Liebig's assistant, and ultimately was entrusted by him with the delivery of the course of lectures on organic chemistry which he regularly gave in the summer semester. It is this intimate personal knowledge of his subject, and the whole-hearted sympathy, appreciation, and respect which a life-long intercourse had engendered, that gives to Dr. Volhard's work its special and peculiar value.

It is quite impossible within the compass of a notice such as this to do more than briefly indicate how admirably Dr. Volhard has risen to his opportunity. As already stated, the work is worthy of the subject, and no higher praise is possible.

Justus von Liebig—the first of his name to be ennobled—belonged to an Odenwald family which could trace its ancestry as far back as 1575. Some of the members spelled the name as it is pronounced, viz. Liebig. Justus was the second son in a family of ten children, and was born in 1803. His father, Johann Georg Liebig, was a druggist and dysalter in Darmstadt, who had his shop in a little house in the Kaptaneigasse, one of the oldest streets in the old town. His mother, Marie Caroline Moser, was described as an active little woman with the bright eyes and sharply cut features of her famous son. Indeed, from her Liebig seems to have inherited also many of his mental and intellectual characteristics, his energy, and remarkable power of work.

It is easy to determine the conditions which made Liebig a chemist. From his earliest years he was familiar with the sight of chemical operations. Chemical utensils and apparatus were his toys, and for a time he had no other aim in life than to follow his father's occupation. But as his knowledge increased his interests widened, and science eventually claimed him. Even before he left the gymnasium he had settled in his own mind what his life's work was to be—"Chemiker will ich werden, nicht Apotheker"—and accordingly in 1820 he was sent to Bonn to listen to Kastner's dull and formal prelections. In the following year he went with Kastner to Erlangen, where he published his first scientific communication. It appears in Buchner's *Repertorium der Pharmacie*, xii., 412, with a commendatory notice from Kastner, under the title "Einige Bemerkungen über die Bereitung und Zusammensetzung des Brugnatellischen und Howardschen Knallsilbers. Vom Herrn Liebig, der Chemie Beflissenen aus Darmstadt." With August von Platen as his friend, Liebig was "ein ganzfidel Student," to whom the Erlangen "Karzer" was not altogether unknown, as the acts of the university testify. Kastner was not very inspiring, and knew nothing of analysis.

From Erlangen Liebig passed to Paris, where, thanks to the interest of Humboldt, he was well received by Gay-Lussac, Thenard, Dulong, Biot, and the rest of the remarkable group which made Paris the chief centre of scientific activity of that age. A new era dawned on Liebig; with Gay-Lussac his relations became especially cordial. They worked together on fulminic acid, and under Gay-Lussac's inspiration and direction Liebig became an investigator. "Liebig," says his biographer, "bewahrte

dem väterlichen Freund die wärmste Verehrung. Sein Zusammenarbeiten mit Gay-Lussac bildet den Glanzpunkt seiner Jugend." To the end of his days Liebig always spoke of this association with the warmest feelings of pleasure and gratitude. He was wont to relate how, when some particularly difficult analysis had succeeded, or when some new and surprising fact had been elicited, the two investigators sought to relieve their excitement by waltzing together round the laboratory table.

It was mainly through the good offices of Gay-Lussac, working through his friend and fellow academician Alexander von Humboldt, that the Grand Duke of Hesse was led to interest himself still further in the fortunes of the young man "der Chemie Beflissenen aus Darmstadt," and in 1824 Liebig, in the twenty-first year of his age, was appointed, without previous consultation with the faculty, and somewhat to their displeasure, extraordinary professor of philosophy at the University of Giessen. On the death of Zimmermann in the following year he became ordinary professor and sole teacher of his subject. Liebig's life during the twenty-eight years he remained at Giessen is, of course, the main theme of Dr. Volhard's book. The principal features of his Giessen career are familiar to everyone who has even the slightest acquaintance with the development of chemistry during the second quarter of the nineteenth century, but these features are now filled in by Dr. Volhard with a degree of detail which is almost Boswellian in its completeness and exactitude. One rises, in fact, from the perusal of the narrative with the conviction that surely the last word on the subject has been said. Liebig's chief work was, of course, done at Giessen, and the twenty years of his subsequent life at Munich, whilst it in nowise diminished, hardly added to the world-wide and imperishable reputation which his sojourn at the "little university on the banks of the Lahn" had secured for him.

Liebig's life was so full, his services were so remarkable, and his achievements so striking, that not even the most unskilful of biographers could fail to invest his story with interest.

Dr. Volhard is very far from being an unskilful biographer, and he has put together his great mass of material with circumspection and judgment. Much of Liebig's correspondence has already been published, and his relations to his contemporaries and to the scientific movements of his time are already well known, and passing references to these matters, sufficient to make the story complete, were alone necessary.

Exception might perhaps be taken to certain features in the construction and plan of the work, and, as a book for general readers, it suffers from the common fault of biographies of being over-elaborate. But Dr. Volhard may urge that his book was primarily intended for those who have a lively and abiding interest in Liebig, viz. the chemists who revere his name and who seek to be inspired by his example, and these will certainly not cavil at the wealth of detail which is manifested in this monumental work.

T. E. THORPE.