

fessor Sumner's little book, the absence of duties, between social classes; the problems of charity, temperance, and all the varied aspects of moral reform. Now, between these practical applications of ethics and the books on ethical theory there lies an unbridged chasm. The maxim of Kant gets ample illustration: "Ideas without content are empty; observation without ideas is blind."¹ When sociologists approach any theory of morals, they exhibit an almost ludicrous ignorance, as when Professor Sumner interprets sympathy in the spirit of unconscious Hobbism. When, on the other hand, a student of the metaphysics of morals approaches a problem of practical conduct, he is apt to find his law unmeaning. Here, then, it would seem, is an opportunity for what may be fairly called inductive ethics. It is not the method which commonly claims this name, and which simply means the exclusion of any evolution of personality; it is the construction of a theory of ethics from an examination of the facts of social life, the data of philanthropy, the testimony of ideal aims, the characteristics of moral personalities. This would be a method of ethics which would be constantly close to life, and which would gather up the real issues of conduct into their higher significance and tendency.

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BACTERIA.

Bacteria. By Dr. ANTOINE MAGNIN and GEORGE M. STERNBERG, M.D., F.R.M.S. New York, Wood, 1883. 19+11+494 p., 12 pl., illustr. 8¢.

THIS portly and handsome volume will be read with interest by all who have followed the painstaking and thorough work of Dr. Sternberg during the last three or four years. To him belongs the credit not only of having translated and published, in 1880, Magnin's useful book on the bacteria, but of having applied himself with tireless devotion and very considerable success to the actual work of laborious researches, often made under discouraging circumstances, and with little genuine sympathy from his fellow-countrymen. Dr. Sternberg is at the head of the American school of working bacteriologists, if, indeed, he is not its only member; so that any work coming from his practised hand should meet with a hearty welcome.

The present volume, which might well be called a handbook of bacteriology, is made up partly of Magnin's older treatise referred to above, and partly of new material supplied

by Dr. Sternberg. Magnin's account of the morphology and the physiology of the bacteria, covering one hundred and fifty-two pages, is preserved intact. The rest of the older book is omitted; and in its place we have four 'parts' written by Dr. Sternberg, and discussing respectively, 'Technology,' 'Germicides and antiseptics,' 'Bacteria in infectious diseases,' and 'Bacteria in surgical lesions.' These, taken together, make up more than one-half the book.

Of Magnin's work it is not needful to speak. His book is familiar. We may turn, then, to the parts prepared expressly by the American author. Under 'Technology' we have a succinct but clear account of the various methods of collection, of cultivation, of staining and of photographing the bacteria, and of the attenuation of virus. Of most of them the author speaks from experience; and this chapter will be of the utmost value to the student and the investigator. Of course, in a subject like this, intricate and refined to the last degree, actual personal guidance is essential, or, at least, highly desirable; and we believe that Dr. Sternberg has given enough of the technology to help, but not enough to harm, the student.

Under the head of 'Photography' (p. 194) the author says,—

"It is but fair to say that satisfactory results can only be obtained by the expenditure of a considerable amount of time and money, as the work must be done with high powers, and the technical difficulties to be overcome are by no means inconsiderable. The illustrations in the present volume may be taken as fair samples of what may be accomplished, and it will be found easier to criticise these than to improve upon them."

The plates are, indeed, of an unusually high order; the heliotypes of human (yellow-fever) blood being something remarkable, and not likely to be improved upon at present.

Under the head of 'Germicides and antiseptics' we observe at the outset (p. 210) the following conspicuous finger-post:—

"If it were proven that the infectious character of every kind of infective material depended upon the presence of a specific living germ, as has been shown to be true in the case of certain kinds of infective material, *germicide* and *disinfectant* would be synonymous terms. Although this has not been proved, it is a significant fact that all of the disinfectants of established value have been shown by laboratory experiments to be potent germicides."

Numerous original experiments are here recorded; and the author agrees with the other authorities in giving little germicide value to most common disinfectants, and in pointing out the extraordinary efficacy of mercuric bichloride.

¹ Kritik der reinen vernunft, s. 81, ed. Hartenstein.

Besides a dozen or so of pages devoted to the rôle of the 'Bacteria in surgical lesions,' and having chiefly a medical interest, the rest of the book is devoted to a long and careful treatment of the 'Bacteria in infectious diseases,' and to the literature of bacteriology. These and the part on 'Technology' include the cream of the work.

At the start the author incidentally draws a subtle distinction, which may or may not be generally acceptable (p. 236), —

"The practical results of etiological studies, so far as the prevention and cure of disease are concerned, are likely to be much greater than those which have been gained by the pathologists;" —

adding directly in a tone of liberal conservatism, which no one can help admiring, especially as it comes from one who is in the advancing column, —

"and if the time ever comes, as now seems not improbable, when we can say with confidence, infectious diseases are parasitic diseases, medicine will have established itself upon a scientific foundation. But this generalization, which some physicians think is justified even now by the experimental evidence which has been so rapidly accumulating during the past decade, would, in the opinion of the writer, be premature in the present state of science. And for the present it seems wiser to encourage additional researches, rather than to attempt to generalize from the data at hand. . . . Those who have had the most experience in this difficult field of investigation are commonly the most critical and exacting with reference to the alleged discoveries of others."

Dr. Sternberg sees clearly enough that one of the most interesting theoretical questions in this whole subject which remains still unsolved is, how does inoculation or vaccination protect? or, in his own words, what is "the rationale of the immunity produced by protective inoculations? . . . Recovery, after inoculation with attenuated virus, is more easy to understand than is the subsequent protection" (p. 241).

Lecturers upon the subject often pass lightly over this point, and, by a comparison with a fermentation in a barrel of cider for example, say, "And just as a barrel of apple-juice can ferment but once under the same germ, so a man usually has the small-pox but once;" the idea being implied, that, as the alcoholic ferment has eaten up its food in the barrel, so the hypothetical small-pox plant has taken out all the available food-material from man, its living prey. Pasteur maintains a position like this; while Sternberg denies that it is a satisfactory explanation, and brings forward a lengthy argument in opposition, some of the points of which do not seem to us well taken. It is, however, the sufficient and fatal objection to the line of thought outlined above, that, while the barrel

of apple-juice is a not-living medium, the living organism is undergoing constant repair, is even growing (in the technical sense) till death comes, and is therefore no fixed quantity, either in composition or condition. Dr. Sternberg would solve the problem by considering the acquired protection to be a 'tolerance,' a 'resistance' of the protoplasm to the new condition; e.g. (pp. 248-249), "during a non-fatal attack of one of the specific diseases, the cellular elements implicated, which do not succumb to the destructive influence of the poison, acquire a tolerance to this poison."

This would explain a temporary immunity, — would prevent a patient from 'giving' the disease to himself over and over again, — but would not explain a lifelong immunity, since new, and perhaps non-tolerating, non-resisting cells are being constantly produced from the old ones. The cells which actually suffered are therefore supposed by Dr. Sternberg to "acquire a tolerance to this poison, which is transmissible to their progeny and which is the reason of the exemption of the individual from future attacks of the same disease."

This hypothesis is certainly clear, and it is only befogged by the author's illustration (?) drawn from budding and grafting.

In view of the fact that bacteria are now believed to do their work largely by producing a genuine not-living poison which affects the living cells, the following is of interest: —

"The tolerance to narcotics — opium and tobacco — and to corrosive poisons — arsenic, which results from a gradual increase of dose, may be cited as an example of acquired tolerance by living protoplasm to poisons which at the outset would have been fatal in much smaller doses.

"The immunity which an individual enjoys from any particular disease must be looked upon as a power of resistance possessed by the cellular elements of those tissues of his body which would yield to the influence of the poison in the case of an unprotected person."

The reader must recollect, however, Huxley's discussion of 'aquosity' and 'horology,' and remember that in such sentences as the following we are doing little more than formulating our ignorance: —

"The resistance of living matter . . . is a property depending upon vitality."

The question is often raised, Where do the pathogenic bacteria come from? Dr. Sternberg says in this connection, —

"If we suppose that under certain circumstances the conditions relating to environment approach those which would be found within the body of a living animal, we can easily understand how a micro-organism which has adapted itself to these conditions

may become a pathogenic organism when by any chance it is introduced into the circulation of such an animal. The culture fluid—blood—and temperature being favorable, it is only a question of superiority by vital resistance on the one hand, or by reproductive activity on the other.

"That harmless species of bacteria may develop pathogenic properties in the manner indicated seems extremely probable; and we should *a priori* expect that such a result would occur more frequently in the tropics, where the elevated temperature and abundance of organic pabulum furnish the favorable conditions required. In this way we may, perhaps, explain the origin of epidemics of pestilential diseases, such as yellow-fever and cholera. If these diseases do not at the present day originate in the manner indicated, they, at all events, have their permanent abiding-place in tropical countries."

Much space is properly devoted to the status of science regarding the individual diseases, and the treatment of them by the author is highly satisfactory. The volume closes with an admirable literature of the subject, for which all students will thank him. But in another edition he should add information as to where the papers of E. C. Hansen can be found. It would be better, also, to give the titles of German papers throughout in the German; and it surely is as needful to mention Schwann and Kützing as Cagniard de Latour, while the failure to record the translation of Schützenberger's work is a serious omission. Aside from these and other insignificant and pardonable errors, the bibliography is very satisfactory. The alphabetical arrangement which has been wisely adopted has one slight disadvantage: we miss the striking evidence of the growth of the subject, which a chronological arrangement such as was employed in the translation of Magnin's book in 1880, and which was in this respect impressive, gave.

On the whole, this book is the most practical, the most complete, and the most useful which we possess upon the subject. It is both a storehouse of principles and a handbook for the laboratory. If a physician or a student, a biologist or a pathologist, can have but one book, this one, because of its lucidity of style, its cool, cautious tone, its breadth and yet its comprehensiveness, and particularly because of its excellent illustrations, is emphatically the one to get. It is deeply to be regretted that Dr. Sternberg cannot be kept busily at work under every favorable condition at the expense of a country to whose service his life has been devoted, and that he is, on the contrary, obliged to write sentences so melancholy as these:—

"All this is admitted, and the experiment is introduced mainly to call attention to a method, which, carefully applied, should enable us to solve the ques-

tion as to the pathogenic rôle of this micrococcus. The writer had mapped out for himself a series of experiments in this direction, and many others relating to etiological questions; but circumstances have not been favorable for the prosecution of experimental work, and he finds himself, somewhat reluctantly, engaged in a review of the field, when it would be far more to his taste to interrogate nature by the experimental method, and thus to aid directly in the solution of these interesting problems" (p. 447).

SCIENTIFIC LINGUISTICS.

Internationale zeitschrift für allgemeine sprachwissenschaft. Herausgegeben von F. TECHMER. Heft 1. Leipzig, Barth, 1884. 16+256 p., 7 pl., illustr. 8°.

THIS new journal appears with an excellent though only partial list of contributors, representing various nations and languages. The articles may be in German, English, French, Italian, Latin, and, under exceptional circumstances, even in some other language; and the international character it is meant to have is perhaps the best justification for its existence. The editor, Dr. Techmer, *privatdocent* at Leipzig, has previously published a work on phonetics; and the most noteworthy article in this number is one by him on the same subject. Most, if not all, of the other articles might well enough have been published in already existing journals. They are all in German, except two in English (together occupying some twenty-two pages out of over two hundred and fifty) and one of about four pages in French. The writers are Pott (*Einleitung in die allgemeine sprachwissenschaft*), Techmer, G. Mallery (*Sign-language*, largely a reprint), Friedrich Müller, Max Müller (a short article in German on a Vedic name which he supposes to be identical with our word 'zephyr,' and to have been originally a name for the setting sun, zephyr meaning the west wind as coming from sunset), L. Adam (*De la catégorie du genre*), Sayce (*The person-endings of the Indo-European verb*), and Brugmann.

Techmer has two articles,—one devoted to the analysis and synthesis of audible speech; the other, to the transcription of sounds; both accompanied by illustrative figures and tables. The former is intended to give briefly what is known on the subject, and to add new contributions. The treatment of vowels is what is likely to interest phoneticians most in this latest work on the subject, especially its position with regard to the English school. It must occasion surprise, not that the English system is rejected, but that the arguments against it are so brief and insufficient; hardly any thing but Bell's work being considered, while