ON HYPOTHESIS IN MEDICINE.

From Dr. H. J. Bigelow's Address before the Boylston Med. Society of Harvard University.

BUT such mental efforts precede the discovery of every law in science. Every discoverer forms his hypothesis, and tests it by the truth ; if the facts are numerous, the inductive method, with its tabulating machinery, offers the surest and the shortest test ; if, on the other hand, the facts are few in number, especially if a law of cause is being tested by laws of phenomena, which then bear to it the relation of simple facts, I doubt if philosophers commonly have recourse to Bacon's tables ; but the process still embodies the soul of the inductive method. It is induction with its tablets in the memory, an analysis far more subtle than the gross elaborations of material tables, but subject to the imperfections of the memory. In proportion as the facts are numerous, or extended through a long period of time, impressions are distorted and effaced, and results become inaccurate. It is this induction of the mind which accumulates what is called medical " experience " ; and it is the multiplicity of facts which makes it so inaccurate. Apart from the results derived from the experience of others, medical experience is preceded by hypothesis. Unless the observer has no aim or object in his experiments, he wishes to ascertain something ; the frequency of a symptom, or the effects of a remedy. His first few experiments give him a leaning to one side or the other, inappreciable though it be, or even disowned by himself. This is his hypothesis, and he goes on to correct or verify it.

All individual experience in life is summed up in hypothesis of future probabilities. By original experience I mean that which is not communicated to us by others : the philosopher has his hypothesis of the laws of the mind ; the burnt child has his equally stringent hypothesis of the action of caloric.

In a word, hypothesis in its wide sense is based upon experience ; it is the sum of past knowledge aggregated, with a view to its bearing upon future knowledge. From the wildest theories of Kepler, to which he was pointed by some hand invisible to other eyes, down to the most inevitable results of accumulated facts, all is hypothesis in its bearings upon the future and the unknown. I am aware that such a view leads to the acknowledgment of an hypothesis of cause based upon experience ; but if we are sure of anything, if we know that a material mass will feel the influence of gravitation, are we not infinitely more certain of the truth founded upon all we know of constant and seemingly necessary precedence in the material and the immaterial world.

Hypothesis is drawn from few facts, and applied to many. It is experience of the past pointing to the future. But as there are some men who buy their experience in life dearly ; who can take no hint ; whose unyielding intellects are not to be impressed by the contact of occasional or inconsiderable truth, so there are minds in science whom no flash of revelation can arouse. The ability to detect scientific truth upon slight indications, marks the genius of the observer. Dullness may detect

truth, as the uneducated peasant stumbles upon a rich vein of ore ; but the true discoverer studies the dip and succession of the strata ; his quick eye detects the " lead blossom " which the metallic salts have nourished ; and he sinks his shaft upon the mineral.

Do not suppose a mind like Louis' ever piled up medical facts, unless to instruct his followers, without some intention, expressed or unexpressed, of investigating them in some special point of view ; and even had he thus amassed ten accurate cases of typhoid fever, is it possible the common lesion should have escaped his notice ? No ; it became in his mind the hypothesis, which the tables of Bacon then tested and confirmed. In observation of details, hypothetic laws of phenomena, or cause, are thus forced upon our notice. It is the nature of the mind to recognize them. If they are imaginary, subsequent induction will demonstrate their fallacy. And while the perception of these simpler laws is inevitable, I would ask whether, in the discovery of more complex laws, the paucity of facts does not compel the assumption of tentative hypothesis, based upon slender evidence ? Could the laws of Kepler of the theory of gravitation, or of luminous undulations, have been evolved by the machinery of any set of tables ? I think not. There were not facts enough to accumulate the common element in quantity sufficient to make it obvious. Its nature was only suspected ; it was taken from elsewhere ; it was supplied by the mind ; its powers were tested, and it was found to account for the phenomena.

The ready detection of this common element, it has been said, distinguishes the genius of the observer. It is talent of a high order. It is a power which at one effort embraces a wide range of knowledge ; whose glance takes in the whole ; it has a breadth of view which seizes and distributes details in all their vastness ; it perceives similarities in the remotest facts ; it intuitively grasps their hitherto unknown relations, and unites them in the bonds of obvious, though startling truth. It is the true wit of science, akin to one of the high characteristics of active intellect, which sees and combines dissimilar ideas in new and sudden relations.

All great observers have possessed this talent for the perception of remote analogies. Of Bacon, who probably did not appreciate its value, Macaulay has said : " He possessed this faculty, or rather this faculty possessed him, to a morbid degree. When he abandoned himself to it without reserve, as he did in the '*Sapientia Veterum*,' and at the end of the second book of the '*de Augmentis*, the feats which he performed were not merely admirable, but portentous, and almost shocking. On those occasions we marvel at him, as clowns on a fair-day marvel at a juggler, and can hardly help thinking that the devil must be in him."

The mind of Newton, sensitively alive to the slightest suggestion of nature, endowed with an exquisite scientific tact, seized and followed up her merest intimations. Through long ages she had hinted to philosophers in the falling leaves of autumn ; in despair she had cried to them in the tumbling rocks and roaring waterfall ; but, toiling with the barren

abstractions of theory, they heeded not her voice. In the falling apple Newton read her wish, and said,

"Malo me—petit—puella
Et fugit ad salices, et se cupit ante videri;"

and he followed her and knew her mystery.

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Smallpox and Vaccination.—The following questions have been submitted to the editor by a correspondent.

"1st. Do you think it necessary that an individual should be vaccinated more than once in the course of life, provided we are *certain* that he had the *real vaccine disease* in the first instance? 2d. If so, how often; and do you think that frequent vaccination will prevent a person from having the varioloid, if exposed to the smallpox? 3d. Will a person who has had the vaccine disease, take the *varioloid from the varioloid*? 4th. Will a person who is not protected in any way, take the *smallpox from the varioloid*? 5th. At how early, and at how late, a period will it do to take virus from the arm, to be used again, and does it make any difference whether it be taken from a child or from an adult, provided they are both healthy?"

To these interrogatories we give the following answers as the result of our experience. 1st. As the question is stated, there is no reason why the operation should necessarily ever be repeated. 2d. Varioloid is exhibited only in persons imperfectly vaccinated; that is, the virus is purulent, or has undergone changes by age and atmospheric exposure, which leave a susceptibility to receive smallpox, but modified by the partial constitutional influence that even deteriorated matter exerts on the system. 3d. Yes, if he had the vaccine disease imperfectly. 4th. Yes. 5th. It may be taken as early as the sixth day, but never later than the eighth or early part of the ninth. Much of the bad virus, and therefore imperfect vaccination, is from matter taken later than the eighth, viz., the ninth, tenth, and even twelfth day—especially when performed by all sorts of persons, with pins, needles, &c. By common consent, a child is considered the best source from which to procure virus.

Healthy Skin.—Messrs. Appleton & Co., New York, have recently published "A Practical Treatise on Healthy Skin, with Rules for the Medical and Domestic Treatment of Cutaneous Diseases, by Erasmus Wilson, Surgeon, &c." It is an admirable work, which must be well received by those who are at all ambitious to understand a subject of such importance as the diseases to which the skin is incident. Under the very best auspices, every candid physician is generally ready to acknowledge his inability to manage many of them, with any degree of certainty. There are a series of steel engravings, illustrative of the anatomical struc-