

THURSDAY, MAY 28, 1896.

*THE PHOTOGRAPHY OF HISTOLOGICAL EVIDENCE.*

*An Atlas of the Fertilisation and Karyokinesis of the Ovum.* By E. B. Wilson, with the co-operation of E. Leaming. (New York and London: Macmillan, 1895.)

PROF. WILSON has earned the gratitude of teachers and students of biology by publishing his "Atlas of Fertilisation." He has collected, on ten plates of a convenient size, a series of photographs illustrating the development of *Toxopneustes*, from the mature ovarian ovum until the formation of a sixteen-celled blastosphere. The photographs were made by Dr. Leaming, from sections prepared by Prof. Wilson; and they have been admirably printed from untouched negatives. Each figure is about three and a half inches in diameter, so that all details capable of photographic reproduction can be easily seen.

The first plate contains two photographs of ovarian eggs, in which the nuclear structure is well seen; a third, showing the nuclear division leading to the first polar body; and a fourth, showing the mature egg after extrusion of both polar bodies. The next four plates illustrate the entrance of the spermatozoon, the approximation of the male and female nuclei, and the formation of the "asters." The sixth plate shows the changes in the approximated nuclei during the pause which follows the entrance of the spermatozoon; and the seventh, eighth and ninth contain twelve very beautiful figures of the first division of the fertilised egg. Finally, some of the later divisions are exhibited on the tenth plate.

The photographs are accompanied by a short but clear account of the phenomena they are intended to illustrate; and in many cases difficult details are rendered intelligible by means of diagrams.

There can be no doubt that this Atlas will be of great service to students and to teachers, as an exposition of our present knowledge concerning the main facts of fertilisation; although one is tempted to regret the absence of any figures demonstrating the number of chromosomes, either in the polar bodies or the pronuclei. The excellence of the work suggests, however, another standard by which to judge it—a standard indicated by Prof. Wilson himself in his preface, when he points out that the most careful drawings involve a subjective element from which photographs are free, and states his belief that, in spite of certain necessary shortcomings, "the photographic plates here presented give, on the whole, a clear and accurate impression of the preparations."

If photography could indeed provide an image of histological preparations, as clear and accurate as that received by the eye of a trained observer, then a great step would have been made; for every histologist would be enabled to convey to others the whole evidence for his statements in a way before impossible; and a photograph, when once successfully taken, might serve as

material for future research in the hands of men unable to procure the object photographed.

Unfortunately, Dr. Leaming's photographs, admirable as they are, do not approach the perfection necessary if they are to be regarded as representing the whole evidence given by the actual sections. This may easily be seen by any one who tries to determine from them the truth of some statements made in the text.

Prof. Wilson holds the view, now shared by the majority of observers, that both the centrospheres of the fertilised egg arise from a portion of the spermatozoon; and he considers that the male and female chromatin elements lie side by side, without mixing, during the division of the single original centrosphere. As evidence of this, he gives photographs 17, 18 and 19, and woodcuts xi. and xii. In the woodcuts, the distinction between the male nucleus and the female is clear and unmistakable; while, at least in photographs 18 and 19, this is not the case. Again, in the photograph fig. 19 there is no clear indication of structure in the male nucleus; while in the woodcut fig. xii. B, which may well have been drawn from the actual section photographed, a distinct reticulum is indicated in its substance.

Few persons will believe that Prof. Wilson has made positive statements on the evidence of sections showing no more than the photographs referred to: every one will feel that the woodcuts represent the essentials of his preparations better than the photographs. So that we have to judge the question, after all, by reading the author's account of what he says he saw; and when photography has done its best, the evidence of the condition of these nuclei at a particular moment still rests upon his reputation as a histologist, as completely as it would have done had he published the woodcuts only, or no figures at all.

In the case just referred to, the author's statement is so completely in accord with those of other workers, that few will hesitate to accept it; but when he points to photograph No. 19 as evidence that the rays of the amphi-aster "are really fibres, and not, as some recent authors have maintained, merely the optical sections of thin plates or lamellæ in a radially arranged alveolar structure," there is equally little evidence one way or the other to be obtained from the photograph, while there is more room for doubt as to the accuracy of the interpretation. The reference is, of course, to Bütschli's work on the structure of protoplasm; and those readers of NATURE who have compared Prof. Bütschli's photographs with his drawings, will remember that in his case also the photographic reproduction of the evidence was not a material addition to the strength of the argument.

On the whole, it seems certain that the best photograph at present possible does not show so much as can be seen by looking directly at a good histological preparation: so that it is not yet possible for a histologist to multiply copies of his evidence in a form from which the subjective element is altogether excluded. There is still no way of testing a histological statement without direct examination of the object described. Further, it seems that a careful drawing by a trained observer gives a better idea of appearances seen under the microscope than the best available reproduction by photography can at present achieve.

W. F. R. WELDON.