towards the periphery, leaving the centre transparent. Sometimes while the area germinativa is still oval, but generally not until it is pear-shaped, there is seen in the long axis of the area pellucida a *clear streak*; with this commences the first trace of the *proper embryo*. This usually takes place on the eighth or ninth day post coitum."

(The remainder of the Report, comprising an account of the subsequent development of the amnion, chorion, umbilical vesicle, &c., we purpose to notice speedily in conjunction with a subject allied thereto.)

STRICTURES

ON

A WORK BY PROFESSOR BISCHOFF,

OF HEIDELBERG, ENTITLED

"*ENTWICKELUNGSGESCHICHTE
DES KANINCHEN-EIES.*"

(HISTORY OF THE DEVELOPMENT OF THE OVUM
OF THE RABBIT.)

1842.

By MARTIN BARRY, M.D., F.R.S.S.L. & E.

THE following is the substance of notes, written nine months since, when I was reading the work of Professor Bischoff. Should the Editor of THE LANCET consider them suitable for insertion in his Journal, I shall feel obliged by his allowing them to be published there.

MARTIN BARRY.

19th, tenth month (October), 1843.

Bischoff, Plates I. to VIII., inclusive.—There is certainly some satisfaction in finding that observations recorded by myself two, three, and many of them four years since, in the "Philosophical Transactions,"* have led to a repetition of the same. But it is not very satisfactory to observe the mutilated form in which my figures are made to re-appear. This last remark is intended to apply more particularly to figures representing the divisions which the essential portion of the ovum undergoes in the Fallopian tube.

Professor Bischoff seems to have adopted, in part, my mode of *obtaining ova* (Second series, l. c., p. 365); had he fully done so, he would not have found it needful to raise the ovum out of the oviduct with a needle, a sort of manipulation that it will not bear successfully. And had he used the ring of putty that I recommended, the ova might have been preserved for days, weeks, and even months, instead of requiring to be kept from drying up by the addition of foreign substances, which not only diverts the atten-

tion of the observer, but completely changes the appearance of the ova, and admits of their being examined but for a very short time. The ovum, fig. 16, it appears had lain in water! Nothing whatever should be added to ova from the oviduct, nor is it advisable to make any addition to those from the uterus that have not attained a considerable size.

From these remarks it may, perhaps, be possible to account for some of the differences between Bischoff's observations and my own.

Nature is not represented in the figures Bischoff has given of the so-called "yolk." This substance, in the mammiferous ovum, as I long since showed, corresponds to little more than the "*discus vitellinus*" in the ovum of the bird, and like it, consists of cells, which, indeed, are represented in two of Bischoff's figures (figs. 8 and 9).

Formation of the Ovum.—No one, on reading page 19 of Bischoff's book, would suppose that the formation of the ovum had ever been described; still less would it be imagined that the writer was confirming observations recorded four years before. But I ask the reader to compare, *in detail*, Bischoff's figs. 10 to 13, with about twenty of my own in Plate V., "*Phil. Trans.*," 1838, and, more especially, Bischoff's fig. 10 with my figs. 2, 3, and 19, in that same plate, a stage being there represented which he actually says (p. 19) I "*overlooked*." [Stages still earlier than this will be found represented in a paper of mine "*On the Corpuscles of the Blood*," (*Phil. Trans.*, 1841, Plate XXV., figs. 164—173, and described § 188—195.) It is there stated that the vesicle called by me the ovisac, with the whole of its contents, arises out of a body having precisely the same appearance as a mammiferous young blood-disc; this blood-disc, as I have shown, being originally elliptical, and not round, the outer part dividing into minuter discs, which, forming cells, coalesce to produce the membrane of the ovisac. The germinal vesicle has previously been formed out of the central portion of the disc.]

Misrepresentations.

Bischoff, p. 14.—What I said regarding the changes in the germinal spot, was obviously meant to apply to its condition, as preparing for fecundation, and I headed the paragraphs, "*Preparatory Changes in the Germinal Vesicle and Germinal Spot*"; yet Bischoff makes it appear as if my description had been intended to apply to the state of the germinal spot *as usually found*—a mis-statement which certainly was not accidental.

Bischoff, p. 4.—I never attempted to show that my "*retinacula*" were the analogue of the chalazæ, but, on the contrary, showed

* Researches in Embryology, first series, *Phil. Trans.*, 1838; second series, *Phil. Trans.*, 1839; third series, *Phil. Trans.*, 1840.

that they could *not* be so regarded. (See my first series on Embryology, l. c., § 92.)

Bischoff, p. 49.—My observations on the time taken by the ovum of the rabbit to pass through the Fallopian tube are not correctly stated. A table (my third series, l. c., p. 565) shows that 230 ova having been found by me in the tube, some of them had been met with there as early as the tenth hour, and others as late as the seventy-second hour, *post coitum*. In the same page (p. 565 of my third series) will be found, also, the following words:—"It will be seen from these tables that ova have been found in the Fallopian tube as late as seventy-two hours, and in the uterus as early as fifty-two hours, *post coitum*."

Bischoff, p. 86.—I never added any chemical re-agent to ova of the size of *Bischoff's* ovum, figs. 29 and 30. He makes it appear as if the addition of a re-agent had been my constant practice.

Bischoff, p. 10.—Professor *Bischoff* has no authority whatever for stating that I appear to have used, for the most part, a magnifying power of 100 diameters. The objects were, for the most part, *delineated* as magnified 100 diameters; but it surely does not follow that no higher magnifying power was used in the examination. The powers employed varied from less than 100 to 800.

Bischoff, p. 89, states that *Barry* has not attempted to explain the appearance of the ovum in his fig. 119 (my second series), which, therefore, and because he (*Bischoff*) saw such a condition of the ovum only *once*, he thinks was an aborted ovum. The reader will find whether I failed to explain this appearance, on referring to my "Second Series of Researches, &c.," l. c. § 201, which paragraph is entitled "*Nineteenth Stage of Development—Hollow Network in the Ovum*." This state of the ovum, then, it appears, was seen by *Bischoff* "only once!" (See my figs. 120, 121, 152, for later stages.)

Bischoff, p. 3, says that the ovulum is "covered on all sides by the cells of the membrana granulosa," and that those cells, being more densely aggregated around the ovulum, form an opaque ring. Yet this, though covering the ovulum "on all sides," he calls a disc. Had *Bischoff* obtained a suite of stages, he would have seen it *sharply circumscribed*, and perfectly *spherical* in form.

Bischoff, p. 30.—"In this state of things, observation needs to take but one step more, *i. e.*, only to see the spermatic threads [spermatozoa] penetrate the ovum, or to find them there. A probability would thus become a certainty." P. 32:—"But I have never been able to convince myself that one of these spermatic threads [spermatozoa] was in the interior of the ovum." Professor *Bischoff* may now be informed that this has at last been done (see "Proceedings of the Royal Society," Dec. 8, 1842), spermatozoa

within the "zona pellucida," *i. e.*, certainly in the interior of the ovum, having been found by myself, and shown to, and acknowledged by, others, among whom was Professor *Owen*, who, in a note I have received from him, states that he "can confidently attest the reality of the spermatozoa." [Since the above was written, I have confirmed my first observation by a second.]

Bischoff, p. 38, acknowledges having seen the germinal spot to appear not quite round, but like a flattened vesicle, and presenting a "pellucid ring." And although, in 1839, he thought himself enabled to pronounce the disappearance of the germinal vesicle in mammals, also, "as a decided fact," he now, in 1842, after seeing my papers, acknowledges (p. 39) that, "very probably, the nucleus of the germinal vesicle [*i. e.*, the germinal spot] is the essential part which first of all experiences the influence of the coitus, namely, a mixing with the seminal fluid." (I had shown the centre of the altered germinal spot to be the point of fecundation.)

Bischoff, p. 56.—"I have certainly several times observed in the yolk a part more pellucid than the rest, the presence of which, undoubtedly, is of great importance." This, probably, was not the germinal vesicle, but an early state of the twin successors of it. (See my figs. 187, 191, 193, in Plate XXIV., "Phil. Trans.," 1840.) I have at this time several ova in a state nearly resembling these, which have been preserved for many weeks by means of the putty ring, the entrance of the air having been further prevented by a cement consisting of gold-size (*lein-oel firniss*) and a little lamp-black.

Bischoff, fig. 1.—What *Bischoff* describes as cells of the membrana granulosa, appear to have been cells of the central part of the retinacula. (The retinacula will be found exceedingly distinct in the ferret, *mustela furo*, which animal I selected when showing these structures to Professor *Owen*.)

Bischoff, fig. 2. — "Fleckiges Ansehn." The same appearance will be found represented by myself in the "Phil. Trans.," 1840, Plate XXIV., figs. 188, 189; and the cause producing it is described in p. 541 of that volume (§ 357).

Bischoff, fig. 6.—The five so-called small yolk-balls, appear to have been cells that had not undergone that liquefaction which removed the other cells in the layer of which they had formed a part.

Bischoff, fig. 16, mistakes blood-corpuscles for cells of the so-called "discus," which, after becoming club-shaped, he supposes to have returned to their previous form. (The ovum had lain in water! P. 64.)

Bischoff, figs. 19, 20, mistakes the incipient chorion for a deposit of albumen.

Bischoff, p. 61, says nothing on the subject of a fact to which I directed particular

attention, viz., that on pressure being applied the chorion *becomes elliptical*. Is this to be expected of mere albumen? (Bischoff had previously said—Wagner's "Physiologie," p. 96—"Most certainly the ovum receives in the oviduct no new covering; it receives no layer of albumen and no 'schalenhaut,' like the ovum of the ovipara.")

Bischoff, fig. 17, mistakes solitary cells, not yet liquefied, for "nachkommen des keimfleckes."

Bischoff, p. 87, after altogether denying the existence of cells hitherto, now suddenly admits them.

Bischoff, fig. 42, g.—"Star-shaped and nucleated cells often uniting with one another." "The situation and relation of these cells between the cell-layers forming the animal and vegetative laminae, make it possible that they belong to that which becomes what certainly manifests itself as the vascular lamina, and that they indicate the commencement of the vessels of the area vasculosa." Compare this figure of Bischoff (fig. 42, g.) and the description now quoted, with fig. 132 in my second series (l. c. 1839), and with the description I there gave of it, viz.,—"Fig. 132. A portion of the network of which the subsequently vascular lamina of the umbilical vesicle consists" (l. c. p. 379). My figs. 120, 121, and 150, are mentioned in that same Paper as representing the succeeding stages, fig. 150 being thus described:—"Vesicles of the outer, and subsequently vascular, lamina of the umbilical vesicle." With these passages before his eyes, and at the same time comparing my fig. 120 with his fig. 41 g., how could Professor Bischoff coolly say, that since the cells in his fig. 41 g. presented precisely such an appearance as that which Schwann had given of the first development of the vessels in the bird's egg, the thought had occurred to him ("so gerieth ich auf den gedanken") whether, at this early period, there might not exist a cell-layer in which the future vascular lamina should have its origin? (See his pp. 96, 97.)

Bischoff, p. 95, boasts of being able to demonstrate two laminae of the "germinal membrane" in the rabbit's ovum, measuring from a line and three quarters to two lines, and forgets (?) that this had previously been shown in a rabbit's ovum of less than half a line, and that (second series, l. c., § 206, figs. 120, 121 A.) the inner layer, or vascular lamina, as I called it, had been stated to present a lamina internal to it. In 1839 I remarked (second series, l. c., § 167),—"There is no fixed relation between the size of the entire ovum and the degree of development of its most essential part;" in proof of which I referred to my fig. 124; and the variable period at which villi begin to appear on the chorion afforded another instance. This irregularity should be borne

in mind. It probably explains how it is that the same appearance should present itself in an ovum of three lines (Bischoff's fig. 42 g.) and in one of two-fifths of a line (my fig. 120), being incipient also in an ovum of one-fourth of a line (my figs. 119, 132). It should be recollected that Bischoff did not always find it in his more advanced ova (p. 97); and that, as above stated, I have met with ova of two lines apparently not more advanced in reference to the network than the ovum in my fig. 119, which measured only one-fourth of a line.

Bischoff, figs. 21 to 30.—The germ dividing and subdividing by means of cells, is coarsely represented as the "zerlegung" of what Bischoff supposes to be the "yelk." The original figures will be found in the "Phil. Trans." for 1839 and 1840; to which, and more especially to the latter volume, the reader is referred for an explanation of the process by which the germ thus reproduces itself, and multiplies its cells—a view being there given essentially differing from the views of others regarding "cells," which latter certainly could not have explained the process. It is deserving of notice that Bischoff, although he takes some pains to show the inapplicability of the theory of "cells" to the divisions of what he calls the "yelk," avoids mentioning my peculiar views on "cells."

Bischoff, figs. 31, 32, 35, 36, 37.—Having failed to find the large cell in the mulberry-like body, Bischoff also fails to discern its nucleus, and mistakes the cells lying around this nucleus, and the cells into which the outer portion of this nucleus has been resolved, for a heap of yelk-globules, remaining over, in order to future use.

Bischoff, fig. 39.—The "fruchthof," represented in an ovum of three-fourths of a line. I am not surprised that Bischoff could describe and figure this region merely as a spot,—the *tache embryonnaire* of Coste,—consisting of nucleated cells in different degrees of aggregation. At this I am not surprised, for Bischoff acknowledges having seen no ova between one-fifth and one-half of a line, and this he calls "a small hiatus" in his observations. It is added, that the "fruchthof" (*tache embryonnaire*) in previously-mentioned ova was not recognised, "but yet, perhaps, was present, and only very difficult to find." At p. 92 it is remarked, "I will not deny that it (the "fruchthof") is to be found in ova of half a line; indeed, it may be traceable to the remains of the yelk-globules, which were not all expended in the formation of the germinal membrane." Bischoff, then, is not prepared to deny that the "fruchthof," or *tache embryonnaire*, may exist in ova of half a line." At p. 91 he confesses having seen no ova between one-fifth and one-half a line. This, as already stated, he calls "a small [?] hiatus" in his observations, which he regrets, be-

cause "Barry's marvellous figures, 121—126, relate to ova of two-fifths, one-fourth, and one-third of a line:" *i. e.*, they relate to just that period concerning which Bischoff confesses he failed to make any observations. On the states represented in "Barry's marvellous figures" (figs. 121, &c.) it is added, "Of importance they cannot be, as, subsequently, nothing is found of them." Yet, after examining larger ova, he admits that "*perhaps there is something present of an explanatory character*" in smaller ones. Yes, Professor Bischoff, had that "small [?] hiatus" been filled up, it would have shown the *mode of origin* of the spot, "*fruchthof*," or *tache embryonnaire*, and the supposed "original foundation of the body of the embryo" (Bischoff's fig. 48) to be merely a *stage* in the growth of what had come into existence some time before. Bischoff would have seen the "primitive trace" of authors to be an accumulation of the cells, or foundations of cells, continually arising in what had been a pellucid space, and marking the locality of the nucleus of the embryonic cell,—the central pellucid groove or channel ("*primitivrinne*") in Bischoff's "original foundation of the body of the embryo," being no other than the elongated pellucid centre of that nucleus.

Bischoff adopts the views of others, that the germinal membrane "thickens" at a certain point, and that in this thickened portion the embryo has its origin. What is the cause of this supposed thickening of a membrane? It is no other than that continual origin of new cells in the pellucid centre of what had been the nucleus of the embryonic cell, and the continual reproduction of the cells so arising. As the embryonic cell exists in the mulberry, while the mulberry is in the centre of the ovum, its nucleus is no part of any membrane. Had investigators begun with smaller ova, *i. e.*, at an earlier period, and had they left no "small [?] hiatus" in their observations, they would have found that it is not a previously existing membrane which gives origin to the embryo, but a previously existing mulberry-like body, which, by certain changes, assumes the form of a membrane, in a certain part of which the development of the already existing embryo proceeds, in the way I have described,—from the nucleus of a cell.

It might appear remarkable that Bischoff should not attach much importance to the "small [?] hiatus" just referred to, since in the same page (91) he had only just said that the changes follow one another with such rapidity that "an accurate understanding is scarcely possible if all the intermediate stages have not been observed." But notwithstanding this most just remark, "a small [?] hiatus" seems to be no uncommon thing in the observations of Professor Bischoff. Thus it appears (p. 54) that his

"conclusions" respecting figs. 185, 188, 189, 190, 193, 194, 195, 199, 200, &c., in the "third series" of my "Researches in Embryology" (Phil. Trans., 1840), were drawn from the examination of the ova of only *three* rabbits (pp. 53, 54), the ova of one of these having lain *in water*, and those of another not having been taken out of the oviduct until "*nine hours* (p. 57) after the rabbit had been killed." Again, on the subject of what is stated in my third series concerning changes following fecundation, before the ovum leaves the ovary, he ventures to pronounce an opinion from the examination of *one dog and one rabbit* (p. 37).*

Professor Bischoff's book affords a striking instance of the truth of a remark made by myself long since, viz., that without a knowledge of the fact that the germinal vesicle returns to the centre of the ovum, it is not possible to learn the mode, the period, or the place of origin of the new being, or, indeed, to understand the ovum in any of its future phases.

In 1839 a note was added to my Second Series while passing through the press, concerning Bischoff's contributions to the plates accompanying R. Wagner's "Physiology," which had subsequently come into my hands. My belief was there stated that, while Bischoff's figures showed him to be in advance of others in his acquaintance with the mammiferous ovum, they also showed that he had not obtained a suite of early stages.—(Second series, l. c., p. 354.) From the *animus* everywhere recognisable in Bischoff's book now under consideration, it is evident that the opinion expressed in that note has never been forgiven. What I then said, however, I am compelled to repeat, and to extend to Bischoff's present communication on the ovum of the rabbit.

There is a word of counsel, too, that I am under the necessity of offering to Professor Bischoff. When he professes to communicate what has been done by others whose researches have preceded his, and yet thinks proper, for some reason, here and there to pass very lightly over, or altogether to omit, certain portions of the history, he should take care that the omitted portions are not, in other parts of his book, inadvertently permitted to creep out.

* I sacrificed nearly a score of rabbits for the purpose of determining the condition in which the ova leave the ovary, and was thus enabled to show that the period of their discharge from that organ is very frequently *nine or ten hours post coitum*, an observation which Bischoff states to have been confirmed by his own.—(See my second series, l. c., pp. 310, 311.)