Facts and Arguments

OPPOSED TO

DR. BENNETT'S THEORY OF ORGANISATION.

BY

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DR. BENNETT, after having reiterated his statements and assured the candid reader that vibriones are formed by the coalescence of molecules, and that the molecules of the ovary *do* coalesce to form the ovum, retires from further discussion. In doing so, however, he treats his opponent with the most courteous and merciful forbearance; and Dr. Bennett is kind enough to say, "It forms no part of *my* intention to controvert the peculiar views of Dr. Beale. I think they may be safely left to the judgment of *physiologists*!"

Two of Dr. Bennett's statements which seem to me unsupported by actual observations have been under discussion:—the statement that ova were formed by the coalescence of the molecules of the ovary, and the statement that vibriones were formed by the coalescence of molecules. These opinions are entertained by Dr. Bennett alone. Now what evidence has he adduced to justify his inferences?

1. It has been elicited in the course of this discussion that the very positive statement, "the molecules of the ovary coalesce to form the ovum," has not been arrived at from original observation, but from an examination of what Dr. Bennett terms the "facts" observed by Nelson, Barry, and others. Now, it has been shown that, in order to arrive at these so-called "facts," Dr. Bennett has termed *ova*, in the ovary of *ascaris mystax*, figured and described by Dr. Nelson as "molecules." In his last paper, Dr. Bennett copies more of Nelson's figures, and maintains that the appearances delineated give him unequivocal support, although neither *Nelson*, *Barry*, nor any other observer, as far as I can ascertain, held the view which Dr. Bennett holds and supports by reference to observations not his own. He still maintains that the molecules in the ovary, by their aggregation, produce "higher forms." "Such is the essence of my theory." (P. 314.)

2. Dr. Bennett has not *seen* vibriones actually formed by coalescence, but is convinced that the particles do so coalesce, and gives drawings of the process as he concludes it occurs. He sees no difficulty in their subsequent division, for a body may be formed by the aggregation of molecules and multiply by division.

My paper on the formation of vibriones is not yet ready; but I may mention that I have not succeeded in making the vibriones come so close to each other as Dr. Bennett represents in fig. c, p. 209; nor do they exhibit any tendency "to aggregate together

and melt into one another!" In spite of the most attentive and repeated watching, continued for more than an hour at a time, with the aid of the highest power I can use (3000 linear), I have never seen two separate particles as close together as represented in Dr. Bennett's fig. 3, or *coalescing to form a filament*. On the other hand, I have *seen* elongated filaments like those represented in 5 and 6 *divide*. All I can make out, is, that the particles, from the very first, *grow* not by the aggregation and coalescence of molecules already formed, as Dr. Bennett asserts, but by the absorption of matters in solution; and that they multiply by *division*. Dr. Bennett thinks a living structure is formed by the physical processes of *aggregation and coalescence*, and may multiply by division.

It seems to me, on the other hand, that the two processes are opposed to each other, because, in the first, particles are supposed to be *attracted towards*, and in the last, to *separate from* each other. These opposite processes are, according to Dr. Bennett, explained by the molecular theory of organisation, and thus the various conflicting views of authors are harmonised!

Dr. Bennett and myself differ in opinion on these matters, and differ also in opinion as to the mode of conducting scientific inquiries of the kind. He grounds his conclusions on the formation of ova, mainly if not entirely upon "facts" observed by others; while it seems to me that the advocate of such a doctrine is bound to adduce actual "facts" which he has himself observed, or to appeal to experiments he has himself conducted.

Dr. Bennett has commented upon two sentences of mine, and I cannot allow his comments to pass without observation. As the whole paragraph is an excellent example of Dr. Bennett's mode of arguing and summing up, it will repay analysis.

The following is my statement on which Dr. Bennett will alone comment:—"A molecule of oil, or phosphate of lime, may result from disintegration; but as such molecule, it can never live. A *living molecule* of oil, phosphate of lime, or any other substance having a definite known composition, is a simple impossibility. We might as well speak of a living mass of iron, lead, or other metal."

Upon this Dr. Bennett comments as follows:—"Now, what is it that transforms cartilage into bone, if it be not the regular deposition of mineral molecules into its intercellular substance—a substance maintained by Dr. Beale to be incapable of living?" (not "*incapable of living*," but "*not possessing vital power*".) "If this is not a living process, what can be such? To say that it is mere infiltration of mineral matter is no argument against its *vital character*; for in the same manner all growth and nutrition consist of infiltrated matter."*

Infiltration a *vital* character! Is infiltration

* In his first lecture in the *Lancet*, Dr. Bennett adduces Mr. Rainey's observations on this very process in favour of his views concerning the aggregation of molecules and molecular coalescence. Now, Mr. Rainey has written one hundred and fifty-two closely printed pages, and has adduced many original observations for the very object of showing not only that the formation of shell and bone, but every soft tissue, is due to the operation of physical force. Many arguments are adduced specially to show that the process of ossification is *physical* and not *vital*, and to prove "the dependence of the rounded forms of organised bodies on physical and not on vital agencies." In Dr. Bennett's first lecture, many statements are advanced in favour of the very same inference, and yet here is one of the most undoubtedly physical processes occurring in the living body claimed by Dr. Bennett as a *vital* process.

going on *out of the body a physical process*, but when it occurs in a tissue a *vital process*?

"All growth and nutrition consist of infiltrated matter." Here it is asserted that the processes or acts of growth and nutrition consist of matter.

Next comes the following:—"Neither it is any argument to say such matters are first in solution. It is only when molecular formations are produced from such solutions, that we have any evidence of their vital nature, as *in* the molecular substance of bone and muscle."

Then Dr. Bennett says, "Again, to maintain that, because the composition of the molecules in a texture is now known, therefore such molecules can never live, is certainly a curious proposition, and must lead Dr. Beale to support the paradox that *nothing* lives in a living structure."

Dr. Bennett must have been a little confused when he thus interpreted the sentences quoted by him. I have merely said that molecules of oil, as such, cannot live. If Dr. Bennett believes in living particles of oil or phosphate of lime, perhaps he will inform physiologists how to distinguish them from lifeless particles of the same substances. Nor am I led to support any such paradox as Dr. Bennett supposes. The so-called nucleus of a lacuna of bone may be *alive* without the hard bone-tissue itself being so. Is every part of a hair or a nail *alive* merely because it is attached to, or a part of a *living body*? Because the nucleus of an epithelial cell is living, must we assume that the outer hardened part (cell-wall) is living also? Is the outermost part of a cell *alive* simply because the matter within gives unmistakeable evidence of life? Is not the shell of a seed which will germinate as inanimate as that of a seed whose germ is dead? The shell once consisted of soft living cells, but the matter formed by their agency has gradually condensed, and now the whole serves the part of a passive, inanimate, protective covering. The shell of a seed takes no active part in the process of germination; nor is the hard osseous tissue already formed, actively concerned in the formation of new bone-tissue. The matrix in which the earthy matter is deposited in obedience to physical and chemical changes was once *alive*, but has *now ceased to live*. The great difference between *living bone* and *dead bone* seems to be, that in the former there is *living matter* (nucleus) in each lacuna; while in the latter the lacunæ are occupied only with fluid or air. It seems to me that, in the case of every elementary part or "cell" composing a living tissue or organism, part *lives*, and part consists of matter that *has lived*—part is "*living*", part has "*ceased to live*". This may appear paradoxical to the author of the "Molecular Theory of Organisation", who leaves it, with other peculiar views, "to the judgment of physiologists".

Dr. Bennett concludes this paragraph with becoming magnanimity. He says: "Lastly, to say of the *theory of an opponent*, that 'it is a simple impossibility', is in science the weakest controversial expedient."

It will scarcely excite surprise that a controversialist who for "ova" and "germinal vesicles" substitutes "molecules", should for "oil or phosphate of lime" read "theory of an opponent". I have not said of Dr. Bennett's theory, that "it is a simple impossibility"; but that a *living molecule of oil or phosphate of lime* is an impossibility. The entire sentence has been quoted above,

For Dr. Bennett to say, "If this figure, which is an *exact copy from nature*, be examined," when he has not copied it from nature,* to assert that "the *throwing off* of germinal vesicles resolves itself into "*the coalescence of these molecules*"; to say that an inspection of certain figures drawn by others *must lead* to the conclusion that the ovum is formed by "an aggregation and coalescence of molecules"; to call Nelson's "germinal vesicles" "molecules"; and all this without taking the trouble to appeal to one original observation of his own upon the formation of ova,—are examples of the "controversial expedients" of Dr. Bennett, but I will not venture to characterise them as "the weakest".

Dr. Bennett stigmatises the doctrine "*omnis cellula e cellula*" as *fallacious* (!), and ventures to translate my notions into Latin. He informs his readers that my idea is "*omnis molecula e molecula*", which is giving me credit for holding the opinion that matter comes from matter!

In this controversy I have endeavoured to say as little as possible about any views of my own; but Dr. Bennett has taken care to let every one know that, like him, I possess "peculiar views". I may, therefore, be permitted to state that the conclusion to which I have been led amounts to this:

That every particle of living matter has been derived from preexisting living matter; that formed matter (cell-wall, intercellular substance, secondary deposits, etc.) was once in the state of living matter; and that the inanimate nutrient matter only acquired vital powers when it comes into contact with matter already possessing these endowments—that is, *living matter*.

* The figure was copied from nature upwards of ten years ago!

SCIENTIFIC JOTTINGS. *Archiv der Heilkunde*, a German medical journal, announces that Professor Wunderlich uses foxglove (*Digitalis purpurea*) with great success in typhus and other fevers. In the former especially he administers it at the time when danger is chiefly threatened by the violence of the fever. When, therefore, in the second week particularly, the pulse is at 120, and the temperature high in the evening, and but little lower on the following morning, Dr. Wunderlich administers to an adult an infusion of one *gramme* of foxglove in water, and continues it until the pulse has fallen to its natural state. This method has never been known to aggravate either the cerebral or abdominal symptoms. Dr. Saint-Martin states in the *Bulletin de Thérapeutique* that the edible birds' nests so sought after by the Chinese possess the most nutritive qualities possible, and are a sovereign remedy in all cases of general debility. A nest well cleaned and ready for the market weighs from fifteen to sixteen *grammes*; is of a greyish-white colour, brittle, with scarcely any taste, and no smell. In this state it fetches about 100*f. per kilogramme*. Dr. Vinson, now at Madagascar, states that worms and caterpillars form part of the delicacies most highly prized by the natives. One kind of caterpillar, remarkable for its long silky hair, spins a cocoon like that of the silk-worm. This cocoon is opened and the animal taken out in the shape of a lump of curds. A sufficient quantity being collected they are fried in oil, a few yolks of eggs added, and the whole seasoned with scraped cheese. This is considered a dish for princes and nobles. The people also dig into the ground to get at a certain kind of beetle, which are boiled in oil or fat, and are thus eaten with great relish. (*Galignani*.)