London physiological journal

London.

I may state, that the specimens most acceptable to me at present are those of the various genera of Brachiopoda; as I am very desirous of fully investigating this group before making my first Report. But I shall be very glad to receive *any* others, provided that the name of the shell is specified, when a fragment only is sent; and the bed from which it is obtained, if it be a fossil.

Bristol, Nov. 16, 1843. W. B. C.

Explanation of Plates VII, VIII.

Fig. 1. Appearance of the membrane of a thin layer of the outer part of the shell of *Pinna*, taken parallel to the surface, after removal of the calcareous matter by acid.

Fig. 2. Thin section of the outer part of the shell of *Pinna*, not acted on by acid; two small black cells are seen, in which the calcareous matter is deficient.

Fig. 3. Section of Nacre, showing the wavy, but usually parallel lines, produced by the plaiting of the basement membrane.

Fig. 4. Section of *Avicula* (?) *longicostata*, showing its coarsely corrugated structure penetrated by tubes.

Fig. 5. Section of the inner part of the shell of *Lima rudis*, showing a finely corrugated structure abundantly traversed by tubes.

Fig. 6. Section of *Terebratula* (recent), showing its peculiar structure, and the large perforations by which the shell is traversed at right angles to the surface.

Fig. 7. Shred of *Terebratula* (fossil) detached by the point of a knife, from a deeply plicated specimen; the difference of aspect between this specimen and the last is entirely due (except in regard to the perforations), to the mode in which the section is made; a natural lamina being obtained in the one case, whilst in the other the plane of section traverses the natural laminæ obliquely.

Fig. 8. Section of the tooth of *Mya arenaria*, showing a remarkable crystalline arrangement.

OBSERVATIONS ON THE SPECIES OF FOSSIL ANIMALCULES DISCOVERED AT PETERSBURGH IN VIRGINIA.

By Edwin J. Quekett, F.L.S., &c.

By submitting to the microscope portions of the several strata which compose the upper crust of the earth, we are made ac-

STRUCTURE OF SHELLS.

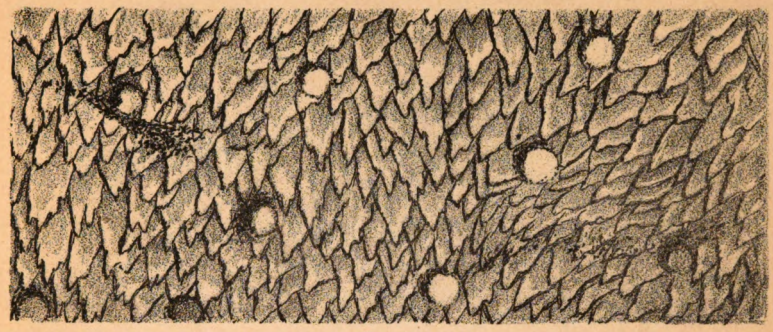

Fig. 6.

Section of Terebratula *(recent.)*

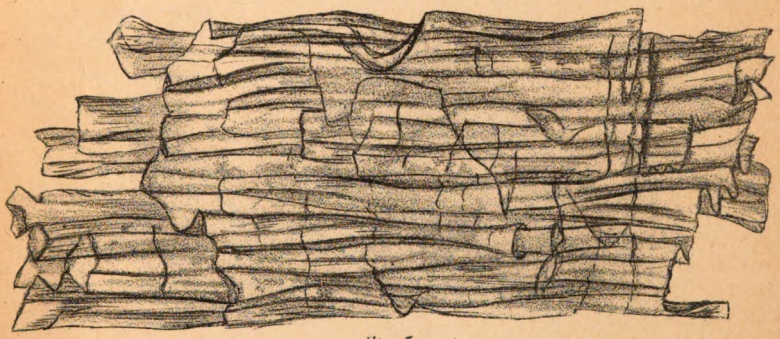

Fig. 7.

Shred of Terebratula (?), *fossil.*

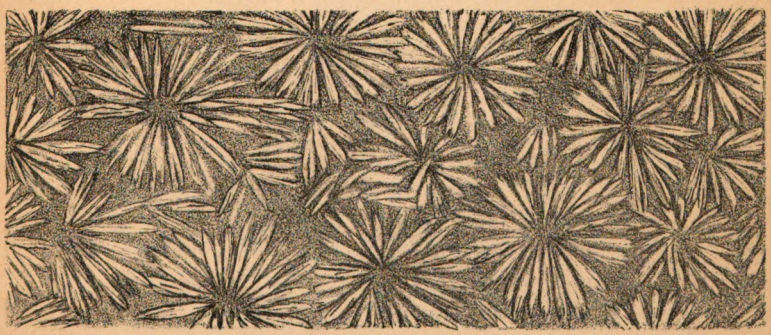

Fig. 8.

Section of Tooth of Mya arenaria.

quainted with the astounding fact, that organisms, so minute as to escape the notice of the unassisted eye, have been employed as agents in accumulating the materials of the surface of the globe—a fact so little expected, and without parallel, where creatures of such tiny dimensions achieve such prodigious results.

Those familiar with the use of the microscope have been long acquainted with certain forms of fossil animalcules, which for the most part have been inhabitants of fresh water and of recent deposit; but it is from Ehrenberg, the greatest authority in these matters, that we first obtained information of the existence of the skeletons of creatures of this class, in strata belonging to the lower tertiary and upper secondary formations, which have been found in the chalk marl, and chalk itself, of this and other countries.

Recently an enormous deposit of a sandy character, more than twenty miles in length and often thirty feet in thickness, has been detected by Prof. Rogers, occurring between the Eocene and Miocene periods of the tertiary formations, at Richmond and Petersburgh in Virginia, which is composed for the most part of the siliceous skeletons of animalcules which inhabited the ocean at that period of the world's history; and the indistructible character of their skeletons, permitting their accumulation for ages, the bed of the ocean has been made dry land from the death of the myriads of such creatures that once occupied the water as their living element.

Through the kindness of Prof. Bailey of West Point, New York, who is now so well known for his zeal in microscopical pursuits, and his admirable essay on the American Bacillariæ in the Transactions of the Association of American Geologists, 1841-2, this country has been supplied with abundance of the deposit from the above localities.

In examining the sand from these two districts, the Petersburgh will be found to be the richer in the varieties of animalcules, and to contain several species which the other does not, and which in fact have not been at present detected in any other situation in the fossil state.

Prof. Bailey, who has minutely examined the sand from Petersburgh, has, in a letter to me, sketched certain forms,

which are different from any hitherto described as existing in any other locality; and mentions, that it is certainly the richest yet found in the number of species contained in a given quantity.

The most common forms met with are specimens of *Gaillonella sulcata*, *Coscinodiscus minor*, *radiatus*, *Patina* and *Oculus Iridis*,* *Actinocyclus biternarius*, *octonarius*, *denarius*, *bisenarius*, and some other species, most of which have been figured by Ehrenberg. With regard to the other species, Prof. Bailey observes, "you will find, without difficulty, numerous specimens of a species of *Zygoceros*, closely allied to *Z. rhombus* of Ehrenberg. Its surface is covered with fine striæ and spots. It probably formed zig-zag chains, like the recent species of Boston Harbour, which I discovered last year, and named *Emersonia elegans*, supposing it to be new. A second very remarkable form, which I believe is also a species of *Zygoceros*, probably entirely new (fig. 3, plate IX), which I propose to call *Zygoceros Tuomeyi*, after the discoverer of the locality."

"One or two species of *Triceratium*† are abundant with the above; but perhaps the most beautiful form is what I believe to be a large species of *Tripodiscus* (fig. 1), fragments of which are abundant, and occasionally entire discs may be found, showing, however *six* feet, sometimes three, four, five or seven, instead of three. Three of these, however, are only seen distinctly at once, the other three then looking like openings. I propose to call this *Tripodiscus Rogersi*, from Prof. Rogers, who discovered the infusorial stratum of Virginia. The feet are placed, as in fig. 1, upon an elevated circle; all the space within the circle is slightly concave, while outside of it the shell slopes abruptly to the outer ring, which is exhibited in section in fig. 2. The whole surface is elaborately marked with cells,

* Prof. Bailey observes, that several species of *Actinocyclus* and *Coscinodiscus* inhabit the Hudson at West Point, and that he has had daily opportunities of examining them in a living state, and probably was the first person to find these creatures, having seen them several years since, but then imagined them to be the cornea of some Crustaceans or insects, and let them pass without further notice.

† One of the species of *Triceratium* appears to be identical with *T. striolatum* of Ehrenberg.

something as in *Coscinodiscus*, but still more complex. I am not aware that either *Zygoceros* or *Tripodiscus* were detected by Ehrenberg in the fossil state."

"Besides the foregoing I have noticed a most remarkable form, of which fig. 4 will give a good idea. It appears like a portion of a *Triceratium*, having four long spines from its disc: the surface is marked much as in many species of *Actinocyclus*. If it proves new, it may be called with propriety *Triceratium spinosum*. I have found but one fragment as yet."

Besides the species mentioned, Prof. Bailey has forwarded skeletons of a most singular form of animalcule, of which figs. 9 and 10 represent a front and side view. Nothing analogous appears to be described by Ehrenberg in his Memoirs in the Transactions of the Royal Academy of Berlin, 1840, and most probably it is the type of a new genus belonging to the family *Bacillariæ*, and may not be improperly named *Ocularia Baileyi*.*

Species of *Dictyocha*, *D. fibula* and *speculum*, together with numerous *Naviculæ*, and fragments of other animalcules, whose form is scarcely to be restored by the imagination, exist together with the above, in the minute quantity of the earth that is required for one microscopic object; probably the thousandth part of a grain may contain at least twenty species of these minute yet wonderful creatures.

The diligence with which Prof. Bailey has examined this earth, leaves but little hope for the future discovery of many other species; still there is the opportunity offered for making some remarks on certain species, and also on the methods of reproduction of the siliceous coated animalcules.

The genus *Tripodiscus* is unquestionably one among the most elegant of either the recent or fossil animalcules; the perfectly circular form of the valves, and the elaborate markings upon each, conspire to make it one of great beauty and interest. The markings are seen to be of two kinds, viz.:—a series of minute circles and multitudes of dots, which appear to be arranged

* This genus is to be recognised by the following characters:—

Ocularia, *Char. gen.*—Animal polygastricum, è Bacillariorum familiâ, liberum, loricâ bivalvi, obliquè ellipticâ (siliceâ) in utroque latere tribusrvel quatuor circulis concentricis notatâ, interno extantiore.—*E. J. Q.*

in lines radiating from the centre; these two cannot be distinctly seen with a high power with the same focus, therefore it is probable that the two kinds of markings are not on the same surface of the valve, but one on each. The fossil specimen is very unlike that figured by Ehrenberg as *T. germanica*, and is rightly considered so by Prof. Bailey, who has given it a different name. Ehrenberg's figure is taken from a recent species, he not having discovered it in the fossil state.*

With regard to the genus *Dictyocha*, it appears to me to be the most anomalous form of skeleton that any animal could possess; and I have long thought, since the discovery of the varied and elegant spicula of sponges by Mr. Bowerbank, that these supposed animalcules of Ehrenberg were nothing more or less than bodies of that nature. This is not altogether conjecture; because one genus at least, of the same character, *Amphidiscus rotula*, has been shown to be but the spiculum of a certain sponge; and it is not unlikely, I presume, that the genus *Dictyocha* may ultimately be found to be composed of like bodies, because the figures of Ehrenberg, as well as the bodies themselves, indicate that the bars of the skeleton have a trace of canal within, which is characteristic of the structure of these organs.

It must have struck many observers, that the most part of the siliceous coated animalcules appear destitute of organs of reproduction, or of apertures through which ova may be emitted; and also that the same manner of self-division, as practised with the soft-coated creatures, could not be effected with so unyielding a material as silica. Still it is to be observed that these creatures, with the brittle shells, procreate probably with as great frequency as other species, and quite in as simple a method.

It is to be observed in most of this division of animalcules, that what appears to be one perfect being, is divided either by a line or band into two symmetrical portions, which portions ap-

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* Besides the large discs of *Tripodiscus* and *Coscinodiscus*, there are to be found some others quite as large as either of the above, but with a very different arrangement of the markings on the valve, being neither dots nor circles, but a pattern formed of continuous lines, having irregular reticulations.—[Ed.]

pear to be not halves of one animal, but two creatures united by one medium. This band or line between the two is apparently more friable than any other portion of the skeleton, and we constantly see the halves separated through this medium, and each possessing a perfect entirety. There can be no doubt that each half has the power of causing to grow from itself, on that side next the band, a portion which becomes ultimately like itself, and the newly formed portions, also, acquire a band on each just as the parent does; consequently the originally twin creature becomes two twins, and occupies double the length of the original, which double length is obtained by the old band elongating to such an extent, until it breaks, when the new creatures become separate individuals, in their turn, to go through the same set of actions. This is clearly to be seen in *Isthmia obliqua* (fig. 11), and there is no doubt that it is the same process by which the other forms of creatures of the same family are perpetuated. In *Diatoma* and *Fragillaria* there is no band connecting two symmetrical halves, but the frustules are applied to each other in a continuous line, not each one becoming distinct; consequently the self-reproduction is only effected by each terminal cell building on another to itself by its peculiar vital endowments.

It is a remarkable fact, that Ehrenberg detected in the chalk and chalk marls from Oran in Africa, Caltanisetta in Sicily, and certain parts of Greece, no less than *fifty-seven* species, which are identical with existing animalcules at Cuxhaven and other localities in the North Sea, making good the opinion entertained by geologists, that in the higher classes of fossil organic remains no representative exists on the earth, but in the lower the identity of many species is perfectly established.

By the aid of the microscope we have been enabled to discover the universality of these creatures, for the same are met with in the polar as are found in the tropical seas, and those of both regions can be proved to have existed at the earliest dawn of this world's existence; which is a striking proof of the important part which these minute organisms were created to perform in the deposition of materials for the earth's surface, and how, by these imperceptible agents, such gigantic consequences have resulted; which stamp upon reflecting minds, that no creature, even the most minute, is formed without special purposes; and

that the least in size of all, by the organization given to them by the great Architect of the universe, have been employed to carry out his unfathomable intentions.

Explanation of Plate 9.

Fig. 1. Portion of *Tripodiscus Rogersi*. Bailey.
Fig. 2. The same represented in section.
Fig. 3. *Zygoceros Tuomeyi*. Bailey.
Fig. 4. *Triceratium spinosum*. Bailey.
Fig. 5. Oblique view of a species of *Zygoceros*.
Fig. 6. Side view of another.
Fig. 7. End view of another.
Fig. 8. Side view of another.
Figs. 9 and 10. Front and end view of *Ocularia Baileyi*.
Fig. 11, *a, b, c, d, e*. Diagrams of different conditions of *Isthmia obliqua* during the process of reproduction.

Reviews and Analyses.

The Physiology of Inflammation and the Healing Process.—By Benjamin Travers, F.R.S., &c.—S. Highley, Fleet Street, pp. 226.

The author of the work, of which the above is the title, has long been favourably known to the medical profession by his writings. His "Inquiry concerning Constitutional Irritation," is quite sufficient of itself to stamp him as a philosophical observer of great merit; and besides th' he "Surgical Essays," which he published in conjunction with the late Sir Astley Cooper, and his "Synopsis of the Diseases of the Eye," have been favourably received by the profession. It was not, therefore, without some degree of interest, and hope of reaping some profit, that we commenced the perusal of this his latest work, and we can conscientiously state, that our anticipations have not been altogether disappointed.

Mr. Travers commences the work, as most authors do, with an "Introduction," in which he alludes to the prevalence, even in the present day, of the doctrines of John Hunter, and to the confirmation of the general principles of inflammation as laid down by that great man; but it was not without some surprise that we found him making such an error as the following, especially while, in doing so, he is alluding to Mr. Hunter's experiment showing the difference between the living and the dead artery. For instance Mr. Travers states, as the opinion of Mr.

Fig. 1.

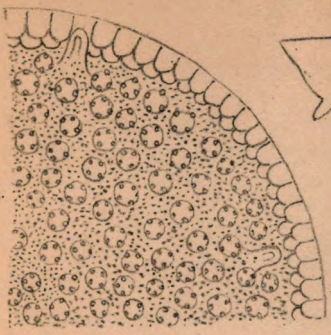


Fig. 2.

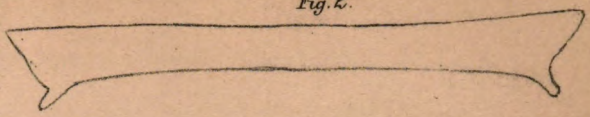


Fig. 4.

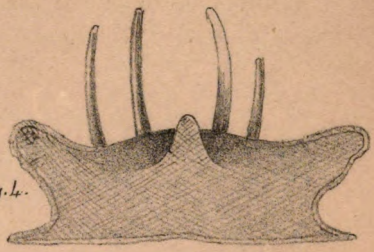


Fig. 3.

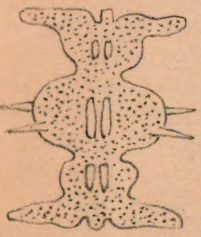


Fig. 5.

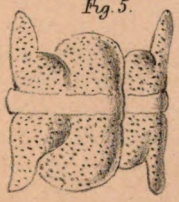


Fig. 6.

Fig. 7.

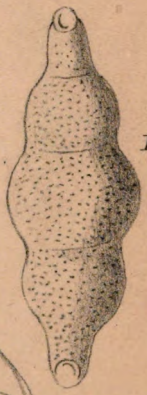


Fig. 9.

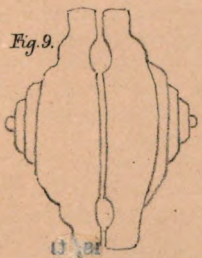
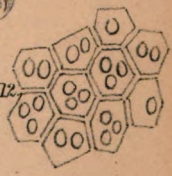


Fig. 8

Fig. 10.

Fig. 12.

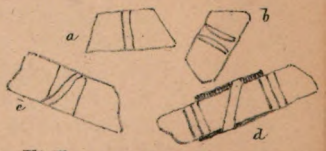


a

Fig. 17.

b

a



b

c

d

Fig. 11.

e

Fig. 15.

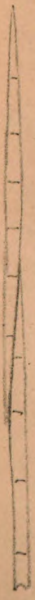
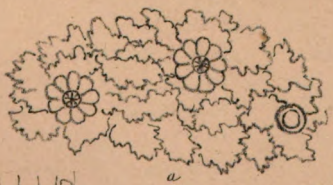


Fig. 16.



a

b

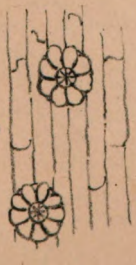


Fig. 13.

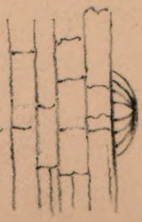


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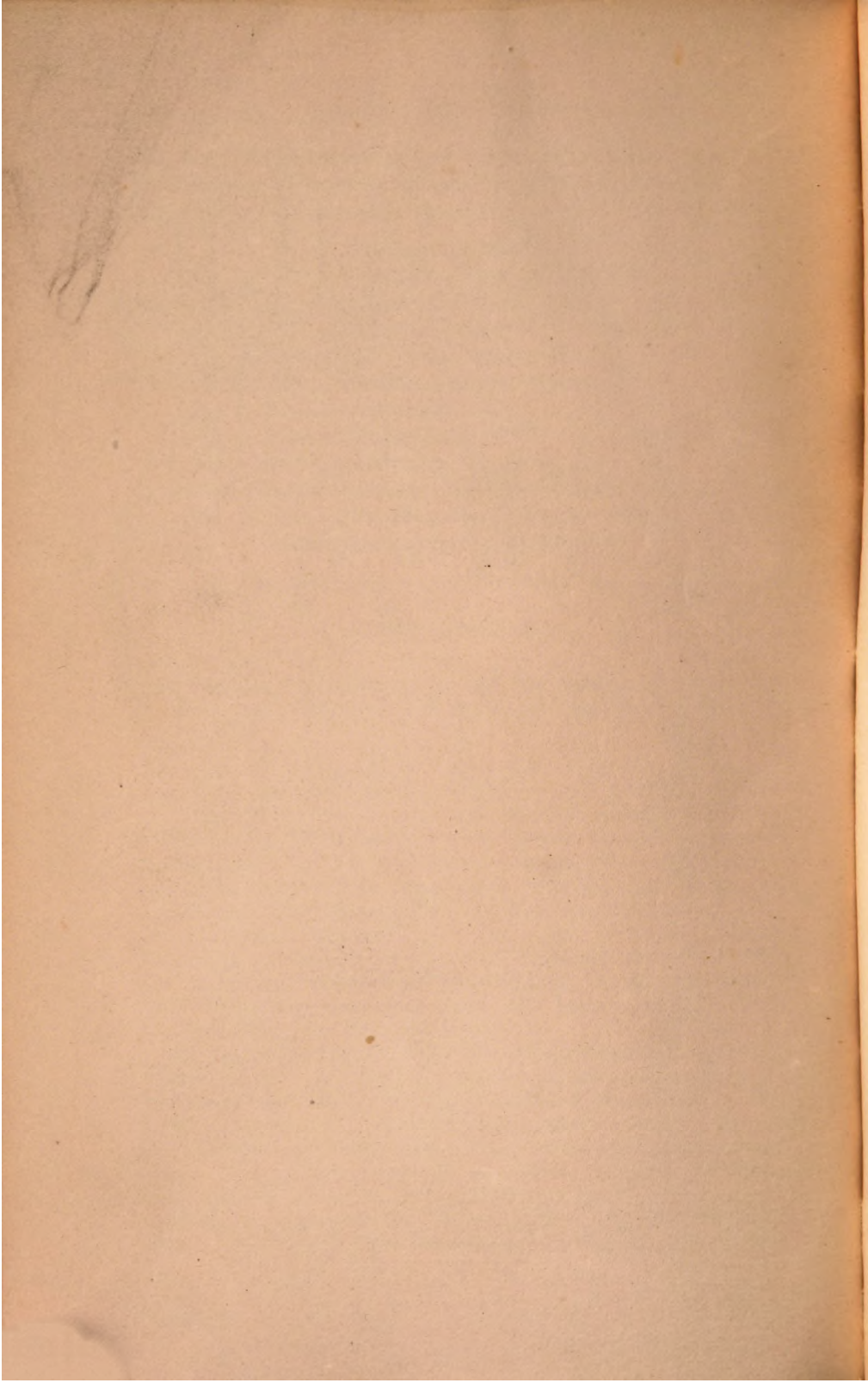
Fig. 14.



Hunter we presume, "in the larger arteries the muscular, and in the smaller ones the *contractile* property, is said to predominate; but whether any order of vessels possesses more than the elasticity which accurately preserves the vessel under its varying dimensions in a state of fulness, is an open question." Now we do not know any work, antient or modern, in which the first part of this sentence is to be found, although many physiologists of eminence think it doubtful if the arteries possess any muscular coat, and therefore any vital contractility. But whatever opinion may be entertained upon the muscularity of arteries the *contractile property* should surely go with the muscular structure; that is, if the commonly received opinions upon what structure contractility is due, are entitled to any weight. It is not improbable that Mr. Travers may have confounded, in this instance, contractility with elasticity; but even if this be the case, he is at variance with the opinions of Mr. Hunter, as the following extract from the work of the latter renders evident:—

"From the account we have given of the substances which compose an artery, we may perceive it has two powers, the one elastic, and the other muscular. We see also that the *larger arteries are principally endowed with the elastic power, and the smaller with the muscular; that the elastic is always gradually diminishing in the smaller, and the muscular increasing, till at last, probably, the action of an artery is almost wholly muscular;* yet I think it is not to be supposed but that some degree of elasticity is continued to the extremity of an artery.

"The muscular power of an artery acts chiefly in a transverse direction;.....the elastic power (power of re-action, *not contractility*) is best fitted for sustaining a force applied to it (*such as the motion of the blood given* by the heart), and propelling it along the vessel; the muscular power, most probably, is required to assist in continuing that motion, the force of the heart being partly spent."

It was Mr. Hunter's opinion, that elasticity was the most fitting property with which the larger arteries could be endowed, since elasticity is the best adapted "for taking off the immediate force of the heart;" and he carefully distinguished the elastic from the contractile, or, as he styles it, the muscular powers of arteries. This opinion of Mr. Hunter regarding the structure of arteries has been confirmed, in every particular, by the first living authority on general anatomy, viz., Henle, the celebrated professor of General Anatomy and Physiology in the University of Zurich, and is one in which we are disposed to concur, notwithstanding that the celebrated Swedish Chemist, Berzelius, could not detect, by chemical analysis, any trace of fibrine (the basis of muscular tissue) in the coats of arteries.

Passing over the "Preliminaries" we proceed at once to the "direct effects of stimuli and of wound." See the author's