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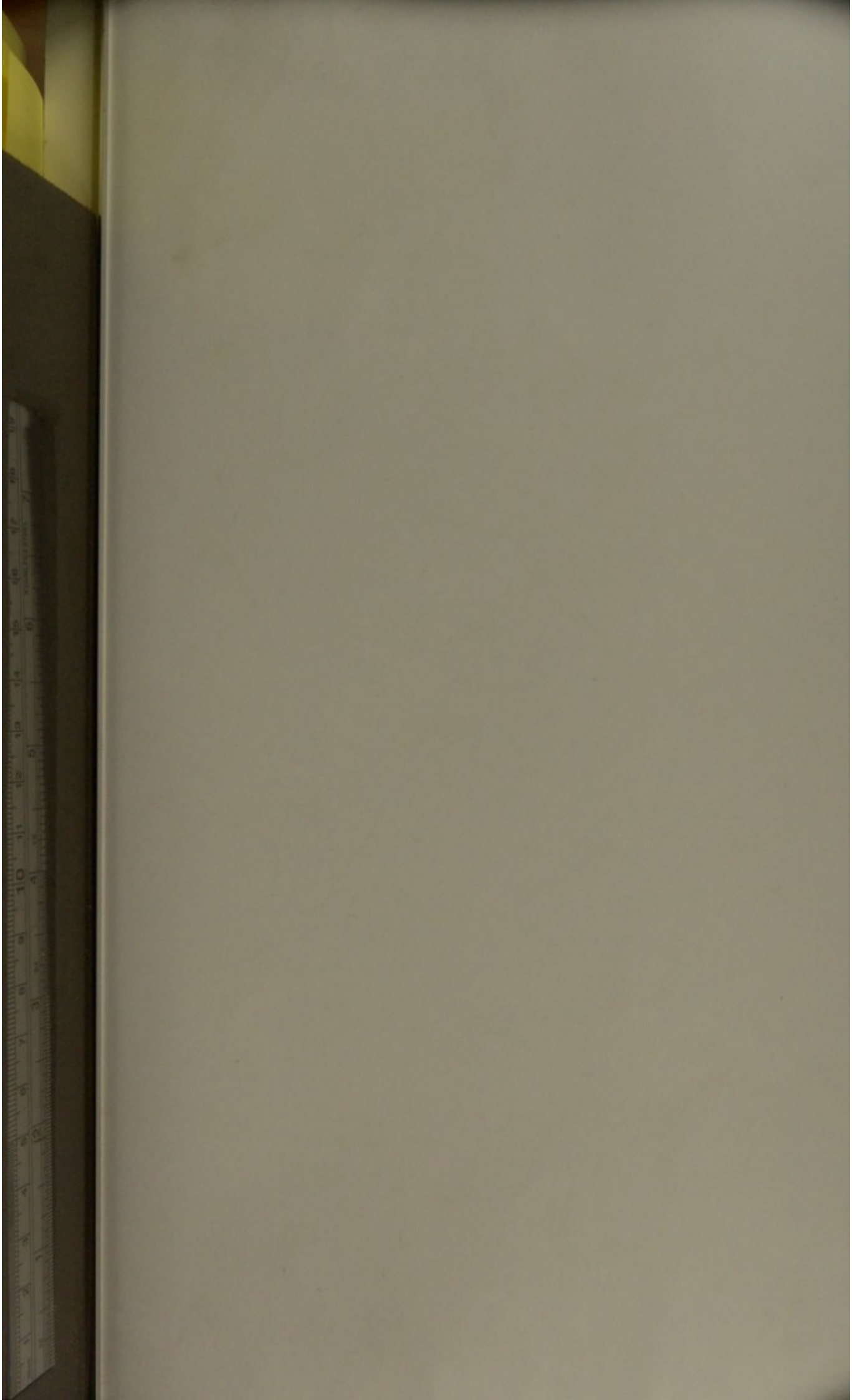

ARTERIAL STRUCTURE AND ARTERIAL FUNCTION.

By G. A. GIBSON.

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ARTERIAL STRUCTURE AND ARTERIAL FUNCTION.[1]

THIS is certainly one of the most interesting of the works which have recently appeared dealing with the circulation, the more so because on many points we find ourselves in opposition to its conclusions. For many years the author has devoted a great deal of time to the study of the vessels, and he has enunciated views which have, to say the least, led to discussion, from which, it is to be hoped, truth will eventually arise. In the volume now before us many of his former observations are brought together; the volume, however, is much more than a mere collection of earlier papers, for it contains a large amount of recent investigation. The work deals with the normal structure and functions of arteries; with blood pressure and its relation to arterial contraction and heart power; with diseased structure and disordered function of arteries; with the methods of estimating arterial pressure, and the results obtained by such modes of investigation. A new schema of the circulation is described in elucidation of the author's views. Much clinical observation is described in illustration of his opinions, and such subjects as angina pectoris, cerebral hæmorrhage, cerebral thrombosis, and the nervous effects of vascular spasm are fully dealt with With so much compressed into the limits of a volume of 194 pages, it must be obvious that there is abundant food for reflection in moderate compass.

It may be said at once that in so far as concerns the description of the normal and morbid structure of the arteries we find ourselves in substantial agreement with the author. The terminology which has been so often employed in describing the changes which take place in the vessels has been characterised not only by striking inexactitude, but also by obvious misconception, and the classification of arterial diseases which is adopted by the author is that which has always seemed to us the most scientific arrangement. As might be expected from the well-known characteristics of the author, the description of the different forms of arterial degeneration is remarkable for its accuracy, terseness, and lucidity.

[1] "Arterial Hypertonus, Sclerosis, and Blood Pressure." By William Russell, M.D., F.R.C.P. Edin. Edinburgh: Wm. Green & Sons.

When we depart from the solid ground of structure and venture upon the quicksands of theory, we do not so decidedly see eye to eye with the distinguished author. It is probable that in many subjects on which he appears to differ from the current views held by those who have long worked at circulatory problems, the root of the apparent divergence lies in the mode of statement. We must be allowed to remark that he frequently puts forward some conception which he states to be the popular belief of the time, and the idea so projected seems to us a travesty of the generally accepted opinion. The chapter on blood pressure and vessel contraction, for example, contains the following paragraph:—"From much that has been written the question might be answered in the positive, and yet the conception is deplorably misleading as a practical guide. The rise of pressure is behind the constriction, and the physiologists measure it in the aorta. The physical law is perfectly simple when truly applied: if the capillaries constrict, the rise in pressure is in arterioles; if the constriction includes arterioles, the raised pressure tells from the small arteries backwards, and so farther and farther back. The whole mixed conception that a constricted vessel has its blood pressure raised has to be abandoned for a more accurate and infinitely more illuminating conception of the changes which take place." We should like to ask for a reference to any contemporary writer who has been guilty of the "mixed conception," as a considerable acquaintance with circulatory literature has failed to put us in possession of any idea of the kind. In the early days of the Ossian controversy it will be remembered that Samuel Johnson thundered the request to James Macpherson that he should produce the manuscripts. Without any particular desire to emulate the ponderous tendencies of the learned Doctor, we would really like to know in what particular enunciation of modern science the author has found the theories which he so warmly denounces. In the same chapter we have again a singular parody of current views. Let us once more quote from the author. "The second factor leading to increased resistance is an alteration in the blood channels themselves. Any narrowing of their calibre is undoubtedly a cause of resistance. That they do so narrow is also beyond question, although the importance of the fact has hitherto been obscured by the one-sided attention and devotion to the vessels as a mere system of elastic tubes." This presentation of "one-sided attention and devotion" is one of the most remarkable statements in modern medical literature, and the humorous side of the question appears when this announcement of the supposed belief is compared with the earlier remarks in the same chapter upon the current teaching in regard to peripheral arterial constriction. So far as we are aware, the conception of the arterial tree as a system of mere elastic tubes exists nowhere in modern literature.

It is indeed possible that the vasomotor phenomena of the circulation have received only too much attention. There can be no doubt that the vasomotor theory has often proved a veritable house of refuge for the pathologically destitute. There is a curious tendency here and elsewhere to hunt with the vitalist (as on p. 38) and at the same time to run with the physicist (as on p. 50); it shows itself from time to time in the discussion of different aspects of the various problems under consideration.

We entirely agree with the author in his statement that contractility is retained by sclerosed vessels. This belief has been sufficiently emphasised by Mackenzie as well as by the present reviewer, and yet, in spite of the remarks which we have both published upon the subject, we find our author making the following remark:—"As has already been stated in a preceding section, the idea of sclerosed and atheromatous arteries has hitherto carried with it the idea of rigidity. This is an unfortunate association, for it has led to the idea that thickened vessels are necessarily permanently thickened, that they behave in the body much as rigid tubes would behave, and that no remedial measures are available for removing such anatomical change." Once more we ask, where are such views to be found as he attributes to modern medicine?

The chapter which discusses the causes of arterial contraction is one of the most interesting in the book, and the author deals fully with the influence of poisonous agents in their double action upon the arteries by evoking contraction of the muscular wall, as well as by producing structural changes in the coats, and particularly in the intima. Here we have a really admirable exposition of a most important subject, illuminated by a wealth of illustrations culled from many a fertile field of physiological and pathological investigation, and brought with rare skill into harmony with clinical and therapeutical observations. This chapter, however, is marred, like so much of the book, by the singular tone of irritation expressed against certain imaginary views, attributed to unnamed observers whom we cannot recall, and who are arraigned for holding opinions which certainly are not current coin. We may again quote from our author. "The mechanical views of the circulation have had their day, and have effected their purpose almost too well; it is now time that we should think of the vessels as *living* tubes, contracting not only under the influence of nerve centres, but under the direct stimulus of substances present in the circulating blood." Where, in the name of Harvey, are views different to those expressed?

When we turn to the chapter on the clinical estimation of blood pressure, we must at once premise that we are quite at one with the author in his objection to the phrase "arterial tension." As a matter of fact, we have never, from first to last, in any of our

writings, employed the term, for the excellent reason that we could never understand in what sense the word "tension" was used. Nothing may be said as regards his exposition of the methods of estimating blood pressure; it describes some of the procedures now so widely employed. But the great point in the chapter is that the author sets himself in opposition to a great deal of recent observation in regard to the factors determining arterial pressure. Put briefly, so far as we are able to grasp the significance of his contention, he believes that while the resistance exerted by the walls of the vessels is practically, if not theoretically, negligible under healthy circumstances, it is far otherwise in cases of arterial degeneration. He therefore places himself in absolute antagonism to Recklinghausen, Masing, and Janeway, who have very carefully estimated the amount of resistance in vessels which have undergone arterial degeneration. The author appears to refer to such investigations when he observes "that similar results have been obtained with arteries which have undergone what I have defined as arterio-sclerosis, is to be explained by the entire loss of tone in the dead vessel, so that it is no longer comparable to the living vessel." There is undoubtedly a good deal of confusion of thought underlying this contention. Everyone recognises that there are two factors in thickening of the arterial wall—structural changes and functional contraction—but it is a singular commentary upon the author's remark to find opposite the page following this forcible enunciation of his views, three figures of arteries showing what the author calls "hypertonic thickening." It would be really very interesting to know the relation of this hypertonic thickening in vessels, which we presume were obtained after death, to the entire loss of tone in the dead vessels spoken of on the previous page. There can be no doubt that his contention regarding the arterial wall emphasises an aspect of pressure estimation which should not be overlooked, but it must, however, be pointed out that even with brachial and radial arteries of the ipecacuan-root type, quite low pressures can be obtained with modern instruments, while, on the other hand, with perfectly healthy arteries the arterial pressure may be very high. The author's preoccupation is a striking instance of excessive devotion to one side of a complex question, and we feel that, although it is useful to have such arguments strongly stated, they constitute only a passing phase of a difficult discussion.

About the new schema of the circulation it is unnecessary to speak. The conditions of the experiment are so unlike anything in the circulation that the results cannot be regarded as being of much real utility. It would certainly have been better to have used arteries instead of rubber tubes, as has been frequently done in earlier investigations. We cannot agree with the author that the rubber tube is a better substitute for the living artery than

the dead one, and we might ask why he did not employ some of those vessels which, as has already been referred to, have retained that function which he terms hypertonus.

The ninth chapter of the work dealing with practical applications is full of interest, but here also our author is troubled by his views regarding the wall of the vessel, and manifests too much disregard of such important factors as the composition of the blood, the changes in the capillaries, and the varying energy of the heart. Throughout this chapter, nevertheless, as indeed in the whole book, the views expressed are in the highest degree stimulating, even when we do not agree with them.

Without a doubt the chapter on the influence of the alimentary system is one of the best in the book, and the author analyses in the most luminous way the well-recognised relations of the alimentary and the circulatory systems. He gives a lucid exposition of recent views in regard to these matters. The same may be said with regard to the section dealing with angina pectoris, in which he brings into strong relief one of the many factors leading to the angina produced by arterial contraction.

This review has already exceeded due limits, but one other point must be referred to. There has been a general belief that elderly persons have higher arterial pressure than those of younger age. Clifford Allbutt has for long insisted upon this view, and it has received general acceptance. Our author sets himself the task of combating this opinion, and he asserts that it is not true. It is freely admitted by all that a proportion of elderly persons retain healthy vessels even to advanced years, while, on the other hand, some quite young people (the case of Wild, for example, in which a little girl of 12 had most advanced coronary sclerosis) undergo degenerative changes very early in life. There can be no doubt that the general belief is a correct one, although it would probably be stigmatised by the author as "an unwarrantable conception." Analysis of the ages and pressures of the group of elderly and aged persons which he gives, however, is in favour of the current view. On p. 121 we find that the average age is 72⅓ years, and the average pressure 180 mm. Hg. Surely the author will admit that 180 is above the normal pressure for the average adult!

We have considered it our duty to speak perfectly frankly in respect of what we consider misconceptions in this interesting volume, and we are certain that the author, who is one of the most earnest seekers after truth, will appreciate our object in being thus candid. One of the main contentions in the work is that the vessel wall plays a very important part in our attempts to estimate the arterial pressure. It is possible that in certain quarters this factor has been underestimated, but we are of opinion that the author attributes too much significance to it. It is only one of a large number of factors concerned in the

maintenance of the arterial pressure, and too much preoccupation with it is apt to make us lose sight of other and equally important influences. Another important argument is that the vessels not only respond through their nervous connections to the influence of toxic agents, but that they also undergo structural changes through the metabolic processes which such poisonous substances produce. Here we are heartily at one with the author, and warmly express our satisfaction that he has so clearly, so strongly expressed his views. The work, finally, is an earnest attempt to analyse and investigate some of the most difficult problems arising in connection with the circulation, and we have the greatest pleasure in recommending it to all those who are interested in such questions. It is instinct with the strong personality of an original thinker, and no one can peruse it carefully without having his mind stimulated to reflection and inquiry.

G. A. GIBSON.