Correspondence.

"Audi alteram partem."

THE JUBILEE OF ANÆSTHETICS.

To the Editors of THE LANCET.

SIRS,—With reference to the allusion made by Sir Joseph Lister at the British Association on the jubilee of anæsthetics I should like to say that the Society of Anæsthetists have not been unmindful of this important date and are taking steps to celebrate the occasion. In order that this may be done in a fitting and proper manner it is, of course, very desirable that we should solicit the coöperation of the profession at large, and I would take this opportunity, therefore, of asking those who are interested in this great anniversary to place themselves in communication with our secretaries—Mr. Walter Tyrrell and Mr. Carter Braine.

I am, Sirs, yours faithfully.

G. H. BAILEY,
President of the Society of Anæsthetists.

Hanover-square, W., Sept. 23rd, 1896.

"WHY IS THE LEFT HEART STRONGER THAN THE RIGHT?"

To the Editors of THE LANCET.

SIRS,—The problem which Dr. Harry Campbell presented under the above heading in THE LANCET of July 4th, and which he there attempted to solve, seems to me becoming obscured by the criticisms of Dr. Haig and Dr. Morison. Dr. Haig remarks: "Surely it is gravity that makes the great difference between the work required of the left heart and that of the right." Since gravity acts downwards, and in the upright position most of the large arteries in man are, on the whole, below the level of the heart, gravity would help the blood to flow away from the left heart and decrease rather than increase its work. In the horizontal position it would act indifferently. Gravity would doubtless increase the work of our left heart if we habitually stood on our heads. Dr. Morison[1] says: "I cannot agree with Dr. Campbell that 'the complexity of a system of tubes does not necessarily increase the resistance to fluid circulation in it.'" The following consideration will, I think, justify Dr. Campbell's statement. Suppose V = the velocity of fluid in a tube A of radius R. If F = the friction per unit length of the tube A, F varies as $\frac{V^2}{R}$. If the tube A bifurcate into two tubes B and C, each of equal section with that of A, it is obvious that the velocity of the fluid in each of these tubes will be $\frac{V}{2}$. If F′ be the friction per unit length of these tubes with a velocity $\frac{V}{2}$ of the contained liquid F′ varies as $\frac{\left(\frac{V}{2}\right)^2}{R}$, that is as $\frac{V^2}{4R}$ or for the two tubes as $\frac{V^2}{2R}$. Hence, by increasing the complexity of a system of tubes in which fluid is flowing it is possible to decrease resistance. In the case I have given the resistance is halved.

If the tube A bifurcate into two tubes B and C whose radii are $\frac{1}{\sqrt{2}}$ of that of A, the frictional resistance will remain unchanged. If the radii of B and C be less than this, the total frictional resistance of B and C per unit length will be greater than that of A. Dr. Morison seems to me also in error in supposing that "the weight of the blood to be moved" is an essential cause of the cardiac difference in question.

If a train of 50 tons weight were loaded with another 50 tons its weight would be doubled, but it would not be twice as difficult to push, and if friction could be eliminated a heavy train would be as easy to keep moving as a light one. The greater mass of blood in the systemic circulation by the greater total of friction points it presents might, however, increase the systemic resistance. Perhaps it was in this sense Dr. Morison meant that increase of mass implied increase of resistance. Dr. Campbell's contention that a special resistance is interposed in the precapillary area of the systemic circulation to secure a sufficient blood pressure and facilitate variations in local distribution is, I think, doubtfully true, though full of the spirit of truth. That the resistance through friction "is relatively greater in the minute arteries than in the capillaries on account of the flow being more rapid in the former," as Dr. Foster states in his "Text-book of Physiology," is easy to admit; but for the same reason it ought to be still greater in the larger arteries, which he denies.

Is the chief resistance in these terminal arteries? It is not an essential condition for arterial distention The Nile rises and overflows its banks though the Delta is a wide and free exit. I believe the left heart is stronger than the right because the systemic arterial system is narrowed throughout for the express purpose of increasing resistance and rendering possible and necessary a specially high blood-pressure. This high pressure is *useful* for facilitating local variations in blood-supply, as Dr. Campbell suggests, and it is *essential* to prevent a limb from becoming bloodless through gravity when elevated much above the heart, thus leaving us free to assume any attitude —I am, Sirs, yours faithfully,

Eltham, Sept. 5th, 1896. D. W. SAMWAYS.

To the Editors of THE LANCET.

SIRS,—The answer to Dr. Alexander Haig's contention that it is gravity that "makes the great difference between the work required of the left ventricle and that of the right" is simply that the left ventricle has much the most work to do *in the horizontal as well as in the vertical posture*. What the influence of gravity on the work of the heart may be opens up a discussion which would lead us too far afield. I will merely point out that the argument Dr. Haig draws from the waterworks is based upon a false analogy. The water company has simply to drive the water up to a given height, and there is a very great difference between pumping a fluid up a tube against gravity and forcing it along a tube which after having ascended descends again. The force required to drive a fluid through a rigid U-shaped tube is exactly the same whether the bend be turned upward, downward, or horizontally, for in the first two cases the retarding tendency of gravity on the ascending current exactly neutralises its accelerating tendency on the descending current. This is the principle of the syphon. Were the bloodvessels rigid gravity would exercise no influence on the circulation, but being elastic they yield to pressure in the manner indicated by Dr. Haig, and this introduces a factor which space will not permit me to discuss. All I will say is that any influence which gravity exerts on the work of the left ventricle must be small. Thus while in the upright posture it works against the ascending flow in the arterial half of the carotid arc, it favours the flow in its descending venous half, and *vice versâ* in respect of the descending aortic circuit. Or, neglecting altogether the influence of gravity on the venous flow, we may set the accelerating tendency of gravity on the large descending arteries of the body against its retarding tendency on the ascending arteries of the head and neck. In considering influence of body posture and of the elevation of the arms on the work of the left heart Dr. Haig neglects the effect of muscle contraction.

Turning now to Dr. Alexander Morison's second letter, I would first remark that it appears to me to leave altogether untouched my refutation of his first letter. As Dr. Morison frequently misreads my article I will briefly re-state its main argument. I contend that a special resistance, absent from the pulmonary segment, is placed in the arterial half of the systemic segment for a special physiological purpose; that the object of this resistance is to obtain a high systemic arterial pressure, this being needful for securing the necessary variations in the supply of blood to different systemic areas; that were there no need for such variations, and were the pulmonary and systemic vascular segments constructed on identical lines, differing only in respect of size, the pulmonary segment would offer much more resistance than the systemic, and the left side of the heart would be weaker than the right. I carefully avoided discussing the nature of this special resistance—how far, for instance, it might be due to differences of lumen in the two systems, and how far to differences in vaso constrictor activity. I may now, however, remark that it is largely due to the small bore of the systemic as compared with that of the pulmonary

[1] THE LANCET, Aug. 29th, 1896.

arteries, and to the greater vaso-constrictor activity in the former.

I will now deal with each of the new points Dr. Morison raises. 1. Dr. Sharpey's experiment simply shows that the pulmonary segment offers less resistance than the systemic. The whole object of my paper was not to deny this, but to explain the fact. 2. Dr. Morison, like Dr. Haig, refers to the influence of gravity on resistance. I have already dealt with this point. 3. Dr. Morison cannot agree with my statement that "the complexity of a system of tubes does not necessarily increase its resistance to fluid circulating in it," and contends that this proposition is refuted by "one of the best-established principles in hydrodynamics." He here enables me to pass from the realm of argument to that of practical demonstration, and to point out a pitfall into which have fallen the most eminent students of the circulation, including such men as Cohnheim, Marey, and De Jager—the latter one of the few physiologists who have ventured to apply the principles of hydrodynamics to this subject. They all assume that the more numerous the tubes in a system through which fluid has to be driven the greater is the resistance opposed to the circulation of the fluid. The fallacy of this position can be experimentally demonstrated. Take an elastic tube *a* and let it divide and subdivide into smaller and smaller tubes after the manner of arteries, and then let these again unite into larger and larger tubes like the veins, finally forming a single trunk *b*. Let the bore of the tubes be such that the *bed* of the system increases with each division, diminishing again with each successive union. We have thus a miniature vascular system whose resistance to fluid circulating through it can be accurately gauged by driving water through *a* with a definite force and measuring the outflow from *b* in a given time. Now take an exactly similar system, and let its main afferent trunk open into *a* and its main efferent trunk into *b*: it will be found upon driving water through this double system that the outflow from *b* is more than before, showing that resistance is diminished. In other words, while we have doubled the number of tubes in the system and likewise the amount of fluid we have diminished the resistance. Here then we have a complete refutation of Dr. Morison's assertion that resistance necessarily increases with the complexity of the system and with the amount of fluid flowing through it.

I am, Sirs, faithfully yours,

Devonshire-street, W. HARRY CAMPBELL.

"BACTERIOLOGY AND THE MEDICAL CURRICULUM."

To the Editors of THE LANCET.

SIRS,—I have read with much interest the article in THE LANCET of Sept. 5th and also Dr. Washbourn's letter on the teaching of bacteriology for medical students. I entirely agree with the view expressed that the time has arrived when every medical student should receive practical as well as theoretical instruction in bacteriology. It would be of great service if we could obtain a general expression of opinion from those who teach bacteriology in our medical schools as to the best method of giving the necessary amount of instruction in this subject. Dr. Washbourn suggests that each student should be required to attend a short course of bacteriology before presenting himself for final examination. This alone, I think, is not sufficient, and I would suggest that one or more questions in bacteriology and a short *vivâ-voce* and microscopical examination should be introduced into one of the final examinations of all examining bodies. The majority of students cannot spare the time to attend a course such as is given in many medical schools for those who are preparing for an examination for a qualification in public health. Thus, for example, in the University of Durham this course consists of three lectures and three practical classes each week for three months. Apart from those who are working for the B.Hy. degree or the D.P.H. only a few of the more enterprising students attend this course. In order to overcome this difficulty and provide instruction in bacteriology for all the students twelve lectures and some six demonstrations in the laboratory are now given as a part of the shorter Public Health course which each candidate for the M.B. degree is required to attend. This entails no additional expense to the student and gives him an opportunity of acquiring some knowledge of the main principles of bacteriology and of learning how to carry out some of the chief practical examinations which are such important aids to clinical diagnosis. This course is shorter than that suggested by Dr. Washbourn, but I mention it to show what is already being done in this direction. In conclusion, I also wish to express my thanks to you, Sirs, for drawing attention to this important branch of medical education.

I am, Sirs, yours faithfully,

Newcastle, Sept. 14th, 1896. GEORGE R. MURRAY.

To the Editors of THE LANCET.

SIRS,—From Dr. Heron's criticism of my letter which you published in THE LANCET of Sept. 12th I fear that my views may be misunderstood. My only contention is that the examining bodies should make compulsory for every student "a course of bacteriology, including practical laboratory work." I think that the exact manner in which the courses are to be held must be left to the individual schools. The keen competition existing between the various schools is a sufficient guarantee that the teaching will be carried out in a way best suited to the requirements of the student. In a course for advanced students such as that given by Koch no doubt the teacher will go upon the lines suggested by Dr. Heron, but for the ordinary medical student, who will not take the trouble, or who has not the time to read the literature of the subject, something more in the nature of oral teaching will be required. But this is quite a side issue. The question of vital importance is the recognition of bacteriology as an essential part of the medical curriculum, and I am glad to find that on this point Dr. Heron and myself are quite in accord.

I am, Sirs, yours faithfully,

Trinity-square, S.E., Sept. 19th, 1896. J. W. WASHBOURN.

To the Editors of THE LANCET.

SIRS,—I was much interested in your very able article on Bacteriology and the Medical Curriculum in THE LANCET of Sept. 5th and in a letter by Dr. Washbourn in the following issue. It is quite obvious that the time has arrived for the various examining bodies to appoint examiners in this subject. Unless the student knows that he will have what knowledge he possesses on any branch of his profession inquired into at the examination table he cannot be relied on to render himself familiar with its details. Nor will a school go to the expense of providing suitable education unless the subject is made obligatory. It is asserted that the five years of the curriculum are already fully engaged. If this is the case it resolves itself into a matter of expediency. Let us have the courage to eliminate from the course a quantity of teaching which is, if not of very little use, at least vastly inferior in importance to the knowledge of bacteriology. The enormous advantage to the hospital surgeon of having to teach dressers who have already been instructed practically as well as theoretically in the principles of bacteriology must have been experienced by everyone who has had an opportunity of contrasting the work of the student who has acquired a knowledge of the subject before commencing his dressership with him who has not. To ensure a maximum of safety to the patient I consider that every student should be obliged to go through a practical course before he undertakes such a serious responsibility as assisting at a surgical operation.

I am, Sirs, yours faithfully,

W. ARBUTHNOT LANE.

Cavendish-square, W., Sept. 20th, 1896.

THE REGISTRAR-GENERAL AND DEATH CERTIFICATES.

To the Editors of THE LANCET.

SIRS,—A few days ago I received a communication from the Registrar-General asking for further particulars of three deaths certified as being due to sarcomatous tumours in various parts of the body, and also a query as to whether "the sarcoma was of a malignant character." Now, Sirs, I was and am completely at a loss as to the meaning of this query. Have any of your readers received such a communication, or can any of them throw any light on the subject? In two of the cases microscopic sections were made and the