

**A defence of Harvey : as the discoverer of the circulation of the blood in
reply to Prof. Scalzi, of Rome / by George Johnson.**

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A DEFENCE OF HARVEY

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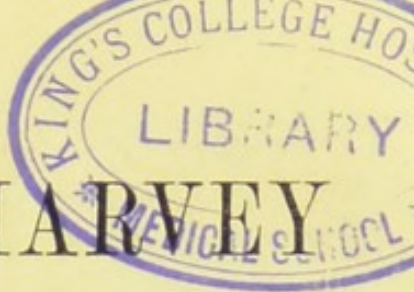
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A DEFENCE OF HARVEY

AS THE DISCOVERER OF THE CIRCULATION
OF THE BLOOD

IN REPLY TO PROF. SCALZI, OF ROME

BY

GEORGE JOHNSON, M.D., F.R.S.

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LONDON

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A

DEFENCE OF HARVEY.

IN the Harveian Oration which I had the honour to deliver at the Royal College of Physicians in 1882, I endeavoured to defend our illustrious Harvey from the monstrous charge of conscious plagiarism which had recently been made by some Italian professors. In doing this I had to make frequent reference to a voluminous work by Professor Ceradini ('La Scoperta della Circolazione del Sangue,' Milano, 1876), and also to two orations, by Professors Scalzi and Maggiorani respectively, which were delivered on the occasion of the inauguration of a monument to Cesalpino in the Royal Academy of Rome.¹ I sent a copy of my oration to each of those distinguished men,

¹ *Inaugurazione della Lapide ad Andrea Cesalpino*: due discorsi letti in questa occasione dai Professori Scalzi e C. Maggiorani.

and, although I have received no direct reply from any one of them, I learn from the 'Buletino della Reale Accademia Medica di Roma,' Anno ix. No. 1, that, at a sitting of the said Academy in December 1882, the subject of my oration was discussed with so much warmth that at the ordinary meeting in January 1883, when the secretary's minutes of the previous meeting were read, the president and more than one member suggested that the record of some too lively expressions ('alcune espressioni troppo vivaci dette a proposito del discorso del dott. Johnson') with regard to my oration should be modified, and, above all, that it should not be published in the Proceedings of the Academy.

The secretary stated that, while he had deemed it right to report literally the speech of Professor Scalzi, the record of expressions which might have been uttered in the heat of discussion should, as is customary, be modified in the direction of greater mildness ('nel senso della maggior mitezza'). It was also announced that Professor Scalzi had undertaken the task of replying to me. I must here express my surprise and regret that my defence of Harvey against his Italian accusers

should have so much disturbed the equanimity of the Royal Academy of Rome.

Professor Scalzi's promised reply was read, and received with applause, at the sitting of the Academy, February 25, 1883—the title of the discourse being 'In difesa di Andrea Cesalpino Scopritore della grande circolazione del Sangue. Risposta al chiarissimo prof. Johnson di Londra.' It is published in the 'Bulletino,' Anno ix. No. 2, and I am indebted for the opportunity of reading it, not to its illustrious author, from whom surely I might have expected to receive it, but to my friend Sir James Paget.

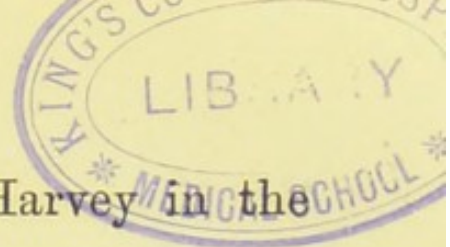
In this defence of Cesalpino, Professor Scalzi repeats the statement of Dr. Ceradini, that from Cesalpino's writings Harvey might have obtained a complete knowledge of the circulation. He also maintains that Cesalpino's works, having arrived at a fourth edition, and having become very notorious in consequence of the controversy (mainly, however, theological) which they provoked, it is not to be supposed that Harvey could have been ignorant of them. He goes on to say that Harvey's silence with regard to these writings excites a suspicion that he, wishing it to appear

that the new doctrine was a product of his own brain, was unwilling to indicate where he had obtained the fundamental facts. If once he had uttered the name of Cesalpino he feared that he might reveal the true source of his discovery.¹

One remark suggested by this charge of contemptible dishonesty on the part of Harvey is that, since Cesalpino's writings were so well known as they are declared to have been, Harvey's silence would not have prevented his contemporaries, some of whom were ready enough to use every means of attack, from exposing his plagiarism, if they could have shown that Cesalpino had discovered and taught the true doctrine of the systemic circulation.

The refutation of these calumnious charges against Harvey is to be found in the indisputable proofs of Cesalpino's ignorance of that which his fellow-countrymen now maintain that he discovered. Professor Scalzi, like Professor Ceradini, whose book I criticised in my Harveian Oration, relies upon three main arguments to

¹ 'Il nome del Cesalpino, solo una volta uscito dalla sua bocca, temeva potesse rivelare la sorgente vera del ritrovato.'



prove that Cesalpino anticipated Harvey in the discovery of the circulation:—

1. He was the first to use the word *circulation*.
2. He describes the passage of the blood into *capillamenta*, a word which is now translated *capillaries*. And so it is said that he described the passage of the blood from the arteries through the capillaries into the veins.
3. He is credited with the true explanation of a vein swelling on the distal side of a ligature placed on a limb.

Now a fair critical examination of each of these arguments affords decisive proof that Cesalpino was entirely ignorant of that which he is declared to have discovered.

He twice uses the word 'circulation' to express the passage of the blood from the right to the left side of the heart, through the lungs. He never applies it to the systemic circulation, as he would have done if he had not been ignorant of the course of the blood in the systemic vessels. Therefore, as no one maintains that he was the first to describe the passage of the blood through the lungs, he deserves no credit for applying the word 'circulation' to the course of the blood from

the right to the left side of the heart—a passage which he, notwithstanding the more correct doctrine which had been previously published by Servetus and Colombo, erroneously believed to take place partly through invisible pores in the septum.

Professor Scalzi, in his oration delivered at the inauguration of the monument to Cesalpino, suggested that Harvey might have learnt from his anatomical master, Fabricius, at Padua, the new doctrine of the systemic circulation. In reply to this I quoted in my Harveian Oration the account given by Fabricius of the function of the valves in the veins, which was published in 1603, a year after Harvey's departure from Padua, and more than thirty years after the publication of Cesalpino's chief treatise (*'Quæstionum Peripateticarum,' libri quinque, Florent. 1571*). Fabricius taught that the purpose of the valves was to prevent overdistension of the veins by the blood in its passage through the venous trunks to the branches, and also to retard the current of blood, so that time may be given for each part to take up its proper nutriment. He states that the arteries have no valves, because, on account of the thickness of

their coats, they are not liable to be over-distended; moreover, in the arteries there is a perpetual flux and reflux of blood (Fabricius, 'De Venarum Ostiolis,' p. 2). This description suffices to show that Fabricius, the most famous anatomist of his day, was entirely ignorant of the systemic circulation, although for thirty years he had enjoyed the opportunity of studying the writings of his fellow-countryman Cesalpino. He could not learn the actual course of the blood from the confused statements of Cesalpino, and, without doubt, he imparted to his pupil Harvey the doctrine which I have here quoted.

When, therefore, Professor Scalzi suggested that Harvey might have learnt from Fabricius the true doctrine of the circulation, the professor must have been as ignorant of the teaching of Fabricius as was the latter of the course of the blood in the systemic vessels. This affords a good illustration of the reckless manner in which unfounded statements are made by Harvey's accusers.

The attempt to show that Cesalpino's use of the word *capillamenta* proves his knowledge of the capillary circulation, is a failure as complete as it is discreditable.

Professor Scalzi quotes the following passage from Cesalpino ('Quæst. Perip.' L. v. p. 116 B): 'Vena cava et arteria aorta reliqua viscera, excepto corde, postquam adierunt, transeunt ulterius, aut si quæ desinunt in capillamenta resolvuntur.' And upon this he comments as follows: 'Here it is very evident that the author, by the name of *capillamenta*, meant, without doubt, to designate the minute terminal vessels, contrary to the distinct assertion of Johnson, according to whom, *in no single passage of Cesalpino's work is there to be found any mention of the capillamenta as channels by which the blood passes from the arteries to the veins.*'

Now a reference to this passage in Cesalpino, and to the context in which he describes in more detail the manner in which he supposes the arteries and veins to terminate, is sufficient to disprove the assertion that the word *capillamenta* is to be translated capillary blood-vessels. In the first place it is manifest, from the frequent references to Aristotle's 'Historia Animalium' and 'De Partibus Animalium,' that Cesalpino's anatomical description is taken entirely from the ancient Greek philosopher. As the authority for the statement

in the above Latin quotation, he refers to 'Hist. Anim.' iii. 3, and 'De Part.' iv. 3.

Then comes immediately the following: 'Indicant et membranæ veluti fores quædam ostiis venarum appositæ in corde, quæ ingressui aut egressui patent, ibi esse omnium venarum principium; sunt enim hæc quasi venarum capita, fines autem earundem in capillamenta tenuissime scissa desinunt. Esse igitur cor principium omnium venarum (arterias enim sub nomine venarum intelligit Aristoteles) ex dictis patet. Sed et *nervorum* quoque ortum ab eodem duci, hinc manifestum fiet.'

From this it is evident that Cesalpino agreed with Aristotle in the belief that the capillamentous terminations of the arteries were, not minute blood-vessels, but nerves.

Again, on the same page (116 E), Cesalpino says: 'Vena aorta appellata nervosa est, adeo ut ejus postrema nervo omnino constant: tenduntur enim modo nervorum et nullo intus cavo distinguuntur (3 de Hist. Anim. cap. 5). Ex dictis igitur apertum est, cor principium esse non solum venarum omnium sed etiam nervorum (De Hist. Anim. 3, cap. 5).'

Here again, on the authority of Aristotle, it is stated that the terminations of the aorta are entirely nervous, and that the heart is the origin, not only of all the blood-vessels, but also of the nerves.

Once more, after quoting Aristotle's description of the connection of the aorta with the nerves, Cesalpino says: 'Quid potest hoc dicto clarius esse? Nihil enim est nervus quam extrema aortæ, alia quidem in capite, id est in cerebro, naturam nervi accipientia, alia autem circa imas partes, id est circa crura et articulos totius corporis' (120 D).

Cesalpino, in this passage, entirely agrees with Aristotle that a nerve is nothing more than the extreme terminations of the aorta.

Lastly, to show that the nervous terminations of the aorta do not convey blood, we have the following passage: 'Si spiritus per nervos deferuntur ad sensus perficiendos, non erit necesse sanguineum esse id quod sentit: nervi enim sanguinem non ferunt' (130 F).

It is manifest from these and other passages, which I have quoted in my oration, that Cesalpino's *capillamenta*, which his fellow countrymen,

with a singular disregard of the inconsistent statements in the context, convert into capillary blood-vessels, expressed nothing more than the old Aristotelian doctrine of the supposed filamentous terminations of the arteries in nerves. And I repeat that, not only does he nowhere describe these as the channels by which the blood is conveyed from the arteries to the veins, but he distinctly asserts, in the passage which I have just now quoted, that *these nervous terminations of the aorta do not convey blood*.

Dr. W. Ogle, in his able and interesting translation of Aristotle's 'De Partibus Animalium,'¹ points out that by the word *νεῦρα*, which had misled some commentators, Aristotle meant not nerves merely but *sinews* (p. 196, note 20), and he believed that 'the small arteries ceased to be tubular and were solidified into tendinous fibres, which being continuous on the one hand with the heart by the aorta, and on the other with the tendons and bones, were the instruments of motion' (p. 203, note 7).

It is obvious that Cesalpino's description of

¹ *Aristotle on the Parts of Animals*, translated, with Introduction and Notes, by W. Ogle, M.A., M.D. London, 1882.



the arteries terminating in capillamentous nerves is a mere reproduction of Aristotle's ancient doctrine without modification or addition of any kind; and it is certain, from numerous passages which it is unnecessary to quote, that the only kind of communication between the arteries and the veins of which he had any conception was that taught by the ancient anatomists—namely, by means of inosculations, which, as he repeatedly says, the Greeks call ‘anastomosis’ (‘Per osculorum communionem quam Græci anastomosim vocant’—‘Quæst. Perip.’ 123 B). He believed that the communication between the arteries and the veins by these inosculations was so direct that, when a vein is cut, dark venous blood first escapes, and subsequently florid arterial blood (‘*Venas cum arteriis adeo copulari osculis, ut venâ sectâ primum exeat sanguis venalis nigrior, deinde succedat arterialis flavior*’—‘Quæ. Med.’ tit. ii., qu. 5, p. 212 C).

Professor Scalzi remarks upon this passage that it clearly indicates a direct communication between the *termination* of the arteries and the commencement of the smallest veins.¹

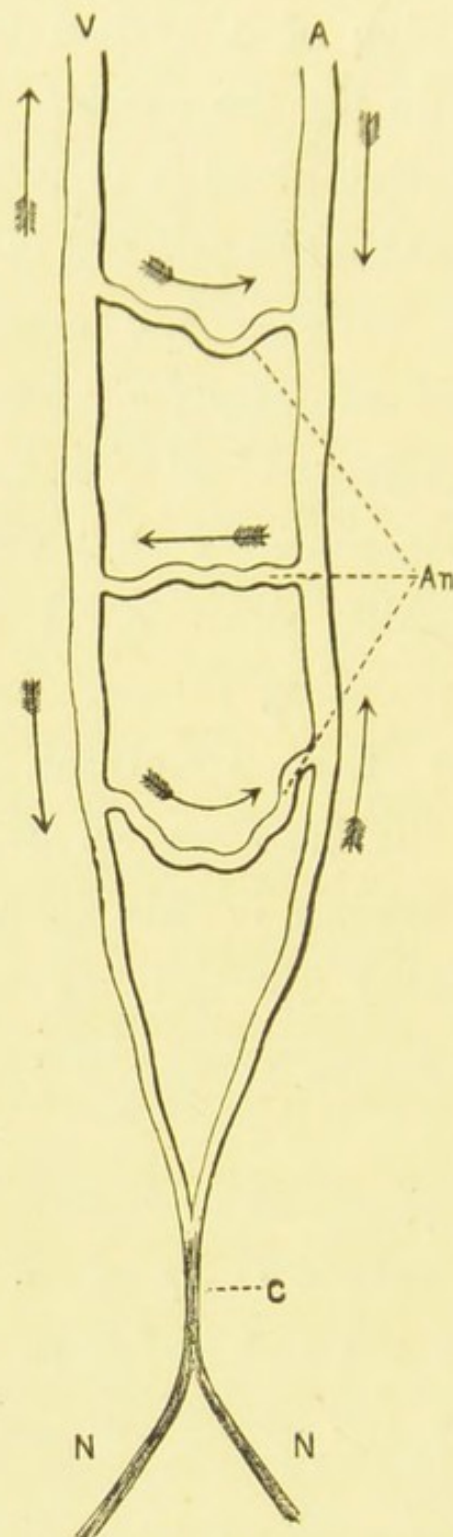
¹ ‘In questo passo è a note chiarissime indicata la diretta immissione delle estreme arterie col principio delle vene esilissime’ (p. 50).

It appears to me, on the contrary, that the passage affords conclusive proof that its author had no knowledge of a system of intermediate minute vessels during the passage through which the bright arterial blood is converted into dark venous blood, and that he believed in a direct lateral communication between the arteries and veins throughout their whole course (*‘per totum venarum atque arteriarum ductum’*—*‘Quæst. Perip.’* 121 D), a communication so direct that an opening in a vein would speedily draw florid blood from its associated inosculating artery. Here, surely, is proof sufficient that Cesalpino was entirely ignorant of a capillary system of blood-vessels; yet Professor Scalzi, in his inaugural oration, reproaches Harvey for having ignored Cesalpino’s brilliant discovery of the capillary circulation.

I have endeavoured to represent Cesalpino’s anatomical description by a woodcut. The arrows indicate the to-and-fro movement of the blood, alike in the artery, in the vein, and in the anastomoses.

Cesalpino’s attempted explanation of the fact

which had been known for centuries—that the swelling of a vein which is compressed by a liga-



A, Artery; V, Vein; C, Capillamenta; NN, Nerves;
An, Anastomoses.

ture occurs on the distal side of the obstruction—so far from showing his knowledge of the circulation, affords conclusive proof of his ignorance. If he had known that the blood in the veins is perpetually passing towards the heart, he would have explained the effect of the ligature in a single sentence. Instead of this we have an entire page of speculation, which serves only to demonstrate his own mental confusion (*‘Quæst. Med.’* p. 234). He quotes an obscure passage from Aristotle relating to an up-and-down Euripus-like movement. He then expounds Aristotle’s doctrine, the substance of the explanation being that ‘during the waking state much spirit and blood are carried to the arteries, whence there is a passage to the nerves’ (not, be it observed, to the capillaries). ‘But during sleep the same heat returns to the heart, not by the arteries, but by the veins, for the natural entrance to the heart is by the vena cava, not by the aorta; for in sleep the native heat passes from the arteries to the veins by the inosculation which are called anastomoses, and thence to the heart. But as the flow of blood to the superior parts, and its reflux to the inferior parts, like Euripus, is manifest during sleep and

wakefulness, so is this kind of motion, in whatever part of the body a ligature is applied, or in any other way the veins are obstructed, not obscure. For as when a channel is closed rivulets swell up where they were accustomed to flow, perhaps the blood at the time returns to its source, lest, being cut off, it be extinguished.' There was no difficulty in understanding that the arrest of a liquid current would cause an accumulation beyond the obstruction. Cesalpino's difficulty was to explain the return of blood by the veins during the *waking state*, and he suggests a metaphysical explanation, which is no explanation at all. Professor Scalzi, apparently, is conscious of this, for, in quoting the following passage from Cesalpino, he omits the attempted explanation contained in the concluding sentence, which I have placed in italics (p. 56). 'Sic non obscurus est hujusmodi motus in quacunque corporis parte si vinculum adhibeatur aut alia ratione occludantur venæ; cum enim tollitur permeatio, intumescunt rivuli qua parte fluere solent. *Forte recurrit eo tempore sanguis ad principium, ne intercisus extinguatur.*'—'Quæst. Med.' 234 C. The meaning appears to be that in consequence of the application of the ligature the

blood *at the time* of its application endeavours to get back to the heart to avoid being extinguished.

The most conclusive proof that Cesalpino had no conception of the perpetual passage of the blood from the arteries to the veins on its way back to the heart is afforded by a reference to those passages which describe or imply the passage of blood from the trunks to the branches of the veins for the purpose of nutrition or secretion. I have quoted several unmistakable passages of this kind in my oration, and I need not repeat them here.

Professor Scalzi appeals to me to listen to what he calls 'the impartial verdict of my illustrious and learned fellow-countrymen, the brothers Hunter,' who he believes, on the authority of Brambilla, have expressed their surprise that Harvey should have had the credit of discovering the circulation. But here the professor has been misinformed. Dr. Wm. Hunter, who alone of the brothers has referred to this subject,¹ while he admits that Harvey discovered the circulation, differs from the rest of the scientific world in his opinion that very little credit is due to him for having made a

¹ Two introductory lectures delivered by Dr. William Hunter.

discovery to which the facts previously known so obviously pointed.

‘There seems,’ he says, ‘to have been nothing more required for making the discovery than laying aside gross prejudices, and considering fairly some obvious truths. It is the more amazing that this discovery was left for Harvey, when we consider that he was near a hundred years after Vesalius, in which interval many great men had appeared, and anatomical schools had flourished in many different parts of Europe. And what is still more astonishing, Servetus first and Columbus afterwards, both in the time of Vesalius, had clearly given the circulation through the lungs, which we may reckon at least three quarters of the discovery; and Cesalpinus had, many years before Harvey, published in three different treatises all that was wanting to Servetus to make the circulation quite complete. But Providence meant to reserve this honour for Harvey, and would not let men see what was before them, nor understand what they read.’

Whatever may be our opinion with regard to Dr. William Hunter’s singular estimate of the problem to be solved, and the supposed inter-

position of Providence in favour of Harvey, it is evident that he considers Harvey, and not Cesalpino, to have been the actual discoverer of the circulation, and this Professor Scalzi would have seen if he had not been misled by quoting his authority at second hand.

Professor Scalzi concludes his address by a comparison of the relative position of Copernicus and Galileo in the history of astronomical science with that of Cesalpino and Harvey in physiological research. As Copernicus discovered and Galileo demonstrated the solar system, so, he says, Cesalpino was the discoverer and Harvey the demonstrator of the circulation. The professor maintains that the University of Rome deserves credit for a sense of justice and a sincere love of truth in having erected to Copernicus, although a foreigner, a public monument side by side with that of their fellow-countryman, Cesalpino; and he calls upon England to acknowledge Cesalpino as the first indicator of the circulation of the blood.

Upon this I beg to say that, according to the professor's own statement, his University will not have done full justice until Harvey's monument

finds a place within its walls. I also venture to suggest that if Copernicus had made some such assertion as that while the sun is the centre of our system during the day, the moon occupies that central position during the night, he would not have been hailed as a great astronomical discoverer; yet such a proposition would not have been more absurdly inconsistent with truth, nor have afforded more conclusive proof of his ignorance than do Cesalpino's statements, that while the blood passes from the heart to the extremities during the waking state, it returns to the centre during sleep; that all the blood-vessels, both arteries and veins, terminate in nerves; that the urine is secreted by the emulgent veins which pass from the vena cava to the kidneys; that as rivulets draw water from a fountain, so do the veins and arteries draw blood from the heart; and that when the arteries of the neck are obstructed, the blood finds its way to the brain through the veins which communicate by inosculation with the arteries.

These confused utterances, to which many others equally absurd might be added, are sufficient to prove that Cesalpino was entirely ignorant

of the systemic circulation; and it is evident that neither Harvey nor any one else either did, or could, ascertain the course of the blood from a study of his inconsistent and unintelligible physiological writings.

I repeat here a passage from my Harveian oration: 'Those who pretend to find in Cesalpino's writings the true doctrine of the circulation endeavour to establish their position by giving to some chance expressions a meaning which the context shows could never have been in the mind of their author; while, interpreting Cesalpino's vague and contradictory statements by the light of Harvey's researches, they ungratefully turn upon the real discoverer, and accuse him of conscious plagiarism.'

So long as these attacks continue to be made it is to be hoped that there will not be wanting those who, impelled by a love of truth and justice, and uninfluenced by petty international jealousy, will do their utmost to expose the erroneous statements and the fallacious reasoning of the immortal Harvey's modern detractors and calumniators.



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