

Book Reviews

Kreislauffunktion in William Harveys Schriften, by WALTER L. VON BRUNN, Berlin and New York, Springer Verlag, 1967, pp. x, 161, illus., DM. 32, \$8.00.

Talking of Harvey we concentrate perhaps too much upon the Copernican revolution in biology and medicine which is due to his discovery of the circulation of the blood. The small book *De motu* of 1628 in which it is enshrined has grossly overshadowed his other literary remains. And yet the latter deserve our full attention as well, if we wish to obtain a picture of Harvey as a whole, i.e. of the historical Harvey. It is in them that not a few of his ideas on cardiovascular function are revealed. Only when these are taken into account and collated with those laid down in *De motu* can the question be answered whether Harvey entertained a consistent theory in this matter; only thus can we hope to discover the links by which all his biological ideas are united. The book under notice is devoted to this theme. Immediately and rightly Harvey's deep-seated and serious adherence to Aristotelian doctrine and method is emphasized: he not only insisted on a theoretical integration of observations and experiments, but 'without exception credited with scientific validity only those results which in the end lent themselves to theoretical deduction.' This must be borne in mind whenever Harvey is presented as a 'modern scientist'. Next his concept of the heart as the unique and uninterrupted source of heat is developed as against the complicated decentralizing ideas of Galen. Hence the emphasis lies on the *impetus* that is conferred by the heart to the exclusion of attracting forces which were prominent in the distribution of the blood according to Galen. It is the impulse through which motion and friction and hence heat are engendered. Another *impetus* is generated by the enlargement—through ebullition—of the cool venous blood that returns to and is rapidly heated in the right auricle. The latter is thus distended—diastole—to be followed by its re-active contraction—systole—and the *impetus* thereby conferred on the blood driven into the ventricle. Curtis has shown in 1915 that, according to Harvey, it is this mechanism that initiates the serial movements of the parts of the heart and thus stands at the root of the circulatory movement of the blood. The latter is in need of the heart as a powerful motor in higher (i.e. warmer) animals. It is, however, endowed with an intrinsic motion of its own—and here the parallels emerge between cardiovascular function and blood circulation on the one hand and generation on the other. The same intrinsic *impetus* which gives the blood autonomous motion is instrumental in converting the resting semen into fertile foam through frictional heating and in driving it out of the seminal vesicles impetuously. All aspects of Harvey's ideas are thus, in the author's opinion, united in this concept of *impetus*. It came to Harvey—the author likes to believe—through the *impetus-theory* of the medieval Occamist interpreters of Aristotle as fortified by the teaching of Galilean Padua and hence known to Harvey. With this the author elaborates an idea that was first briefly mooted in Erna Lesky's brilliant exposition of the Aristotelian influences and their limitations in Harvey's embryology (*Arch. Gesch. Med.*, 1957, 41, 370). It was then applied to the mechanical aspects of Harvey's doctrines by Magnus Schmid ('Der Weg zu Harvey', *Sber. phys.-med. Soz. Erlangen*, 1958, 79, 66–101). Extending this to Harvey's theoretical biology as a whole and making it the link that unites the mysteries of generation with those of cardiovascular function the author has rightly

indicated some points which must be critically considered and which impose certain limitations on his thesis:

(1) *Impetus* may mean no more than a *term* to denote impetuous or rapid movement. It was so used by Harvey on many occasions and also by many authors before and after him.

(2) *Impetus* as an intrinsic quality of living matter is, in Harvey's biological ideas, *nothing primary*. It is *re-active* to the *sensibility immanent in such matter* and it is this that must be regarded as the primary quality. In other words *impetus* is the sign of the *irritability* of living matter. Indeed, as Joseph Needham showed in 1934, Harvey anticipated much of Glisson's theory of tissue irritability, and this, we would add, through the vitalist-Aristotelian orientation which he had in common with Glisson. (For Harvey's immediate influence on Glisson in this matter see: *Bull. Hist. Med.*, 1967, 41, 497–514).

(3) It is, therefore, imperative first to divest Occamist and Galilean theories of their mechanistic tenor before they are applied to the whole of Harvey's biological ideas—a field so highly charged with vitalism, particularly where blood and semen are at issue. Hence the author judiciously proposes a vitalistic interpretation of Harvey's concept of *impetus*.

One of Harvey's main propositions on cardiovascular function indeed sounds like an epoch-making application of Occamist and Galilean *impetus-theory*. In Galenic physiology a gradual slow shifting of blood had been visualized by virtue of the pulse-making faculty of the arterial wall. By contrast Harvey stated that at one single attempt the whole of the ventricular blood is thrown into the arteries owing to the impulse and momentum communicated to it by the violent motion—contraction—of the ventricle.

However, Harvey here gives no indication that he was influenced by the *impetus-theory*. On the other hand there is a single passage where he does allude to it, namely in his work *On generation* (Exercit. L. tr. Willis, p. 364 seq.). However, here Harvey betrays interest neither in the theory as such nor its revolutionizing influence and applicability; it merely serves a semi-theological argument against Sennert. The latter believed in a soul that was super-added to the semen—to be *transmitted* to the embryo. It is just Harvey's rejection of this idea that, in the reviewer's opinion, forms one of the main pillars of Harvey's vitalist convictions. The living, i.e. functioning, unit is alive as such by dint of its intrinsic qualities such as *sensus naturalis* and motion. Its life is immanent in and inseparable from its matter. It is not infused into it by an outside agent such as the soul. The living unit is matter and intrinsic vital principle (comprising *sensus* and impulse) at the same time. It is 'disposed'—and therefore 'working-matter'. As such it tends to realize the purpose and plan of a specific idea. Hence Harvey's insistence on *centralization* and *immanence of forces* in the organism. The seminal '*instrument*' is thus seen as 'working-matter' and indeed comparable to a projectile rather than a piece of inert matter that works at the command of a superadded soul. Unlike the latter the life-principle of the embryo is *not transmitted* from outside, but *develops de novo* inside the latter and owes its existence to both the *ovum* and the male geniture. Sennert had decided in favour of a superadded soul and against the *impetus* (projectile) theory. He had done so after a

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discussion of the various possibilities and it is not unlikely that it was from this or the writings of Sennert's contemporary opponents that Harvey derived a knowledge of the projectile-theory. For this formed a stock-piece in coeval dissertations on generation.

Impetus, then, as far as used by Harvey, is not necessarily bound up with the scientific revolution in physics and mechanics or any theory underlying it. For it is difficult to overrate the vitalist tenor of Harvey's propositions. Moreover *impetus* is *not the only link* by which his biological ideas are connected or can be visualized as an organic whole. To mention only a few of the most pregnant of Harvey's ideas, there is the concept of working-matter, the concept of circularity, of immanence and of centralization.

The merit of the book under notice would, then, lie in the first place in a number of penetrating analyses of Harveian physiological concepts. In this respect the emphasis laid by the author on the relationship between heat and motion calls for particular attention: in Harvey's view heat is generated and maintained by motion and this helps to understand much that is said and implied in *De motu*. Heat and motion are further shown to be exchangeable: motion engenders heat, but heat also gives rise to motion. This mutuality is presented as significant in the initiation of life in the fertilized germ. The demonstration of the roots of the idea that heat is generated by motion in ancient and notably Aristotelian cosmology and of similar contemporary notions to Harvey is of additional value.

In the second place the work must be appreciated as a serious search for a conceptual link between what sounds mechanistic in Harvey on the one hand and what makes him a determined vitalist of the Aristotelian stamp on the other. This has been attempted through a sustained examination of one of such conceptional links. Inevitably one of the best by-products of this is the defence of Harvey's Aristotelian method. It is here presented as a factor that places Harvey among the leading spirits of his century. For the contention that aggregation and sorting out of facts, that mere induction and the 'clumsy office-clerk methods' (*unbeholfene Kanzlistenmethoden*) of Sir Francis Bacon have launched modern science is, as the author says, behind the times. Harvey, by contrast, developed a constructive and specific biological method which enabled him to anticipate modern tendencies in the chemical and physiological treatment of central problems of biology and pathology. The discovery of blood circulation is a fruit of this method.

The well printed volume contains a number of clear and aptly designed diagrams and its value as a work for reference owes much to a careful index of names and subjects both to the text and the notes. The latter contain important historical-philosophical material. This may be lost, however, to the reader who resents thumbing-exercises, as they are placed far away from the text at the end.

WALTER PAGEL

The General Principles of Avicenna's 'Canon of Medicine', by MAZHAR H. SHAH, Karachi, Naveed Clinic, 1966, pp. xl, 459, illus., Rs. 50.00, \$15.00.

This impressive-looking volume by Lt. Col. Mazhar H. Shah, former Chief Medical Officer of the Jinnah Central Hospital, Karachi, merits attention for at least two