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WILLIAM HARVEY, NEUROLOGIST*

BY

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The first injunction laid by William Harvey upon the Harveian Orator is that the Oration shall be "a commemoration of all the Benefactors of the said College by name." This practice has fallen into disuse, perhaps because the benefactors became too numerous, but I propose to make an exception in this historic year. I am sure it would be Harvey's wish that I should express our gratitude to the Wolfson Trustees for their magnificent gift to the College, which will do so much to enable it to meet the growing demands upon it, and to maintain in a future which will far outlast our individual lives those immortal traditions to which Harvey himself so greatly contributed.

Next, Sir, may I thank you for the honour you have done me in choosing me for this distinguished office, which I appreciate not only for the honour it is, but also because, during the last year, I have often felt as though at your bidding I were living in the seventeenth century, in which I have come to know William Harvey afresh and admire him the more as one belonging to that rare genus of geniuses the comprehensive man.

And I cannot better carry out Harvey's second injunction—to exhort our Fellows and members "to search and study out the secrets of Nature by way of experiment"—than by offering them Harvey himself as an example. And surely it is through a common devotion to the science and art of medicine that they may best "continue in mutual love and affection amongst themselves."

It is sometimes thought that three hundred years after Harvey's death there can be nothing new to say about him. I am sure that is not true. But as this year's Orator I am peculiarly fortunate in being able to comment upon a new book by Harvey, published for the first time within the last year, the *De motu locali animalium*,¹ translated by Dr. Gweneth Whitteridge, on whose work I have freely and gratefully drawn. This book, however, is available for all to read, and, so far as it embodies the views on muscular action traditional in Harvey's day, it may be thought to be interesting but perhaps unexciting. If, however, it is considered in relation to two of his other works, the *De generatione*² and the *Prelectiones*,³ it becomes possible to extract from the three together a fairly coherent idea of his conception of the functions of the nervous system. And from these and other sources we can glean evidence of his clinical observations in the sphere of nervous disease. I hope to show that Harvey, though he was not an original contributor to our knowledge of neurology, nevertheless had what was, for the times in which he lived, a quite exceptional interest in the functions of the nervous system, and grasp of the

problems which neurology presents, and that in some interesting respects his insight anticipates the conclusions which later workers, with facilities which he lacked, were able to reach.

Harvey, like all his contemporaries, was so dependent upon the work of his predecessors that it is sometimes difficult to decide which of his ideas were original and which were derived from accepted authorities. Indeed, it would be impossible to be sure about this without having read at least all Aristotle, Galen, Vesalius, and Fabricius wrote, which I cannot claim to have done. Nevertheless, this is perhaps not very important, partly because I am more concerned to present the ideas in Harvey's mind than to decide how far they were original, and partly because Harvey does sometimes himself identify his own ideas by the use of his particular symbols or otherwise.

Functions of the Nervous System as Conceived in Harvey's Day

If we are to appreciate Harvey's critical judgment we must first be familiar with the general views of nervous function current in his time. We may begin with Galen, whose own observations had added considerably to the knowledge of neurophysiology and who was still a dominant influence. Galen had observed that dividing the spinal cord paralysed the body below the level of the lesion, that its hemisection had this effect only upon that side on which the lesion was made, and that longitudinal section did not produce paralysis. He noted that injury of the recurrent laryngeal nerves made an animal dumb, and that this happened, too, when the intercostal muscles were cut, which also abolished expiration, the same effect being produced by dividing the intercostal nerves.⁴ To explain these observations it was necessary to suppose that some exciting stimulus passed from the brain down the spinal cord through the intercostal nerves to the muscles, to cause their contraction. What was the nature of the stimulus?

Vesalius⁵ expressed Galen's views when he wrote: "The brain . . . produces . . . the finest and subtlest of all (the three spirits, namely) the animal spirit. This it uses partly for the divine operations of the Reigning Soul, partly, however, it distributes it continuously to the organs of sense and motion through the nerves, as through little tubes." This animal spirit, Galen thought, came from the cerebral ventricles, where it had been formed by the brain from the vital spirit reaching it from the heart. From the ventricles it flowed to the cranial nerves, spinal cord, and peripheral nerves.

The idea that the nerves were hollow tubes was a very old one, having apparently originated with Alcmaeon of Croton, who lived in the fifth century B.C. and discovered the optic nerves, and probably derived the

*The Harveian Oration, delivered at the Royal College of Physicians of London on October 19, 1959.

idea of their hollowness from observing their subarachnoid spaces. Galen clearly had some doubts about this, for he said: "We cannot absolutely pronounce whether the power flows from the brain through the nerves to the limbs and the essence of the spirit reaches the feeling and moving parts; or whether it in some way or other strikes the nerves so as to induce in them a powerful change which is propagated through the parts to be moved, whether there is in each nerve an innate spirit belonging to it, which is struck by something coming as a sort of messenger from the first principle; or whether the spirit flows from the brain to parts on every occasion when we will to move them; or whether in the third place there is merely a change in the qualities of parts contiguous to each other (which appears to me to be hinted at by some who say that the influence is a power without a substance) I am not able easily to determine."⁶

Galen distinguished between motor and sensory nerves, though he thought that both were efferent, carrying impulses from the brain. "Through some nerves," he wrote, "the brain transmits the power of sensation to the parts below, through others voluntary movement. It is intelligible that all the nerves should have both these powers, but the soft are more suited for sensation, the hard for movement."⁴ Vesalius, like Galen, kept an open mind about the nature of the nerve-impulse, but introduced a variation into the Galenic alternative—namely, that it might be conducted "through passages in the nerves, as is the vital spirit through the arteries, or along the surface of the nerves, like the ray of light along a column, or simply through the continuity of the nerves." Fabricius, whose views as Harvey's teacher are important, attributed muscular contraction to an impulse from the brain and spinal cord passing to the muscle through the hollow nerves.

In Harvey's time the cerebral ventricles were held to be the site of certain mental faculties. The origin of this doctrine is discussed by Pagel.⁷ It was unknown to Galen, and appears to have been originated by the Christian writer Nemesius, Bishop of Emesia. Nemesius allocates the middle cerebral ventricle to cogitation and reason, the anterior to sensation, and the posterior to memory. St. Augustine also accepted the ventricular location of mental functions, of which he put forward two alternative schemes. Vesalius, however, rejected these ideas on the ground that the ventricles could hardly be associated with the higher human faculties when they were all present in so many stupid animals, notably the ass. These, then, are the broad outlines of the theories of nervous function which were generally held in Harvey's day.

Muscular Contraction

Harvey's new book, the *De motu locali animalium*, as Dr. Whitteridge points out in her introduction, consists of notes for a treatise, begun in 1627, added to on several occasions, but never cast into a final literary form. There had been a number of works with similar titles by previous authors to whom Harvey is obviously much indebted, notably Aristotle, Galen, and Fabricius*. Indeed, the first seven chapters of Harvey's book are, as Dr. Whitteridge has shown, "an examination, or rather a rehearsal with a certain amount of comment, of Aristotle's teaching concerning movement, and animal movement in particular." Much of this deals with the mechanics of muscular action, and is of no particular interest. As Dr. Whitteridge says, "the statement (Chapter 2) that 'nothing can both move itself and be

moved in relation to the same action' makes clear the difficulty of thinking about action and reaction in the days of pre-Newtonian mechanics. Harvey mentions in this connection the action of leaping out of the stern of a boat (p. 56), but as he says no more about it one is left to wonder whether he was interested in the reaction of the boat." However, as the previous line contains the illustration of "two men striving against each other back to back" it is possible that Harvey was dimly anticipating Newton's third law.

Harvey's predecessors were divided on the nature and origin of the contractile elements in muscle. I have not time to discuss this controversy in detail now.⁸ Fabricius accepted the Vesalian view that muscle developed out of the tendons, which were the main contractile element. Harvey, in Chapters 10 and 11 of the *De motu locali animalium*, discusses all the arguments of Fabricius and makes it clear that he himself considers the flesh to be the main factor in muscular contraction.

Tonic Movement

After discussing the mechanics of movement, he introduces a distinction between movements such as pushing or pulling, which we may term active movements, and what he calls "tonic movement." "Tonic movement" is a term used even before Galen chiefly to denote sustained muscular contraction. Harvey's discussion of it is an excellent illustration of how his mind worked, getting ideas from observations on insects and birds, brooding on their implications, and groping towards new conceptions. "Tonic movement," he says, "occurs in the case of the water-snake, the spider, and, very evidently, birds" (*D.m.l.* 27).† A little later he explains the significance of the spider. "While I was pondering these things I saw a spider as if divinely sent borne through the air by an invisible thread spun from its own body, yet it held on to the filament with its feet in tonic movement as Mr. Parson's buzzard on a fowl" (*D.m.l.* 29). "Tonic motion," therefore, means "to be contracted, to remain contracted, to keep the muscle tense and still in tonic motion: Δ a kite‡ in the wind, a trout in a stream" (*D.m.l.* 65).

Later Harvey says, "Examples of [tonic motion or lineal contraction] are seen in the trout and the kite, in tetany, in keeping something contracted" (*D.m.l.* 119), and these illustrations are shortly afterwards (p. 121) amplified in the statement: "Tonic movement is required to stay still in a stream or on sand and by its means does a kite hover in the wind and a trout hang in a torrent." It is characteristic of Harvey that while Galen⁹ illustrates "tonic motion" by "any bird" and "someone who swims against a current," and Fernel¹⁰ speaks merely of "a bird," Harvey thinks specifically of a kite and a trout. He continues: "There are two kinds of tonic motion, either of the whole animal as in the case of the kite, or of the parts. Tonic motion of the parts occurs, according to Galen, when two muscles act in opposition to each other whose

*Aristotle's *De partibus animalium*, *De motu animalium*, and *De incessu animalium*; Galen's *De usu partium corporis humani*, and *De motu musculorum*; and Fabricius's *De motu locali animalium*.

†To make it possible to refer to the quotations from Harvey's writings, I have adopted the following abbreviations. *D.m.l.* for *De motu locali animalium*. D.g. for *De generatione*. P. for *Prelectiones*; in each case followed by the page number. In the only published edition of the *Prelectiones* both sides of each sheet have the same page number. I have therefore indicated the left-hand page by the page number alone and the right-hand page by the page number with c. (for contra). The full particulars of these books are given in the list of references.

‡The bird, not the toy.

weakness gives tremor, Δ balance needle; when one muscle is contracted in sleep, sphincter etc., whose weakness gives relaxation; when several synergists work to produce stillness by acting either altogether, by turns or in part: Δ in putting down, in sitting, and again in regulating the antagonists: flitter, fly, plane . . . " (*D.m.l.* 121). Here we find the germ of the idea that tonus, as sustained muscular contraction, is responsible for the posture either of a part of the body or of the body as a whole.

How does a trout maintain its position in a swiftly moving stream? An expert tells me that it is done "by means of continuous slight swimming movements. These involve principally almost imperceptible movements of the tail, with perhaps occasional steering movements of the other fins. When they are maintaining station in clear water it is known that they do it visually."¹¹ Retinal impulses, then, evoked by movement of the fish relative to the stream bottom stimulate the appropriate slight swimming movements necessary for the fish to maintain station. The kite and the kestrel, of course, maintain their position in much the same way, hovering with rapid but very small wing-beats, and since the bird's eyes are on the ground visual stimuli may well act as in the trout. It is characteristic of Harvey that he distinguishes the three types of flight which he describes as "flitter, fly, plane." Flitter denotes the rapid wing-movements of the hovering kite or kestrel; fly the wing-beats of a bird moving from one place to another; and plane the movement of the bird as a whole while its wings are fixed in "tonic motion" as it uses an upcurrent to move forwards along a cliff-face or, like the glider, to soar circling upwards lifted by a thermal. "The eagle and the kite," said Harvey, "plane, striving against the movement and fluctuation of the air" (*D.m.l.* 57).

It is also typical of Harvey that he saw the homology between the tonic movement of the spider, "divinely sent," paying out its invisible thread with all its legs in flexion, and Mr. Parson's buzzard on the fowl. Harvey must have seen many buzzards: what made him mention this one? We can only guess, but I suspect that Mr. Parson must have reported to Harvey as something exceptional its tonic grasp on the fowl, perhaps after it was captured, or even killed.

This makes it clear why for Harvey sustained muscular contraction and alternating movements merged into one another, and he found evidence of this in disease. "Tonic movement when it waxes and wanes creates tremor, namely, whenever, on account of weight, strength is required there tremor indicates weakness: Δ . . . in the heels" (*D.m.l.* 57). It seems likely that this last reference is a description of ankle clonus. "In old men tremor begins in the head and in the hands when they are kept extended for a long time holding up weights. . . . When strength goes the shakings are frequent and more afflicting" (*D.m.l.* 57). Here tremor is correlated both with disturbances of muscle tone and with weakness.

Harvey made some acute observations on the role of the antagonists in muscular action. Commenting on Galen's view that in relaxation the muscles in part act and in part are moved, Harvey says, "but they are antagonists, for their task is partly to maintain a retarded and regulated action, Δ laying down a wegge, going dancing etc. . . . in relaxation, the muscles in part both are moved and move and in part are moved but do not act" (*D.m.l.* 57). "If the action is to be

made in the regulated manner," he writes, "then the necessary relaxation is also regulated, Δ the tibialis muscles when sitting down and tapping with the foot" (*D.m.l.* 119). And again, "to set aside or put down by quietly opposing resistance [to its weight] is seen to be a combination of tonic movement and relaxation and to be half-way between doing and making. It occurs in sitting down, in leaping in dances, in dancing in any part, in laying down something with the hand" (this explains the earlier reference to "laying down a wegge"), "in nodding; in regulated movement, as that of a somewhat paralysed neck, the antagonists are moved correspondingly fast or slow in equilibrium. Wherefore there are degrees of movement: perceptible movement, relaxation, and tonic movement" (*D.m.l.* 141 and 143). This was perhaps as near as unaided observation could get to the idea of the inhibition of antagonists.

The Organization of Movement

In the fifth chapter of the *De motu locali animalium* Harvey discusses the classification of different types of movement made by his predecessors, especially Aristotle, Galen, and Fabricius, with special reference to the extent to which they are under voluntary control. Different types of movement had in the past been attributed to supposedly different parts of the soul, the vegetative part, the nutritive part, etc. Harvey was clearly dissatisfied with this theorizing, and at the end of the chapter puts forward his own view. In the existing state of knowledge this was necessarily very incomplete, but its chief interest lies in the fact that it is a unified view, which makes no demand upon any hypothetical functions of the soul. Harvey writes: "Should we not rather say this? Movements of the organs are all connected with the animal parts and cannot be divorced from the animal. Of these, some which arise from the needs of the body or from the will are to some greater or lesser degree under our control, as respiration, defecation and the movements of muscles in general, while other movements are entirely not under our control. Or again, some movements continue indefinitely, as the movement of the pulse and respiration, defecation and vomiting; others do not continue indefinitely and these are performed in accordance with Nature's demands, that is, they are dictated by the will or the needs of the body, while others are beyond natural needs and are dictated by the emotions" (*D.m.l.* 45).

The existence of involuntary movements led him to two important conclusions. The first was that organs which are the site of such movements must be supplied with some form of sensation which does not enter consciousness. "As there are some actions and motions the government or direction of which is not dependent on the brain, and which are therefore called *natural*, so also is to be concluded that there is a certain sense or form of touch which is not referred to the common sensorium, nor in any way communicated to the brain, so that we do not perceive by this sense that we feel" (*D.g.* 432).

Harvey's second conclusion is that whereas voluntary movements are under the control of the brain, involuntary movements are not. The evidence for this is derived partly from experience, partly from experiment. Discussing vomiting and diarrhoea as the results of movements of the stomach and bowels, he says: "As it lies not in our power either to provoke or to restrain

their motions, neither are we aware of any sensation dependent on the brain which should arouse the parts in question to motions of the kind" (*D.g.* 431). The other evidence is experimental, and here is one of the two experiments described by Harvey in the *De motu locali animalium*. "△ a cock's head off, the arteries being ligatured and artificial ventilation being given, movements are seen to persist but they are as the movements of men in delirium and useless and convulsive and irregular as those of drunkards" (*D.m.l.* 103 and 105). How close Harvey is here to Hughlings Jackson, who saw delirium and drunkenness as paralytic phenomena.¹² From these observations Harvey reached the following general conclusion: "It is one thing for a muscle to be contracted and moved, and another for it by regulated contractions and relaxations to perform any movement, such as progression or prehension. The muscles or organs of motion, when affected with spasms or convulsions from an irritating cause, are assuredly moved no otherwise than the decapitated cock or hen, which is agitated with many convulsive movements of its legs and wings, but all confused and without a purpose, because the controlling power of the brain has been taken away: common sensation has disappeared, under the controlling influence of which these motions were formerly co-ordinated to progression by walking or to flight" (*D.g.* 433).

He also recognized, however, that consciousness might play a large or small part in the control of the same movement. Thus, he said: "Embryos and animals at first walk delicately and practise the discipline of local movement just as a man who is learning to play upon the lute is always guarding against mistakes; their gait is vacillating, ambling paces" (*D.m.l.* 105). On the other hand, there is such a thing as "playing on the lute without being conscious [of the movements of the fingers]" (*D.m.l.* 41).

Sensation and Perception

Harvey had little to add to the ideas of the role of the peripheral nerves in sensation current in his day. Sensory and motor impulses were alike conceived as centripetal. There is, however, a hint of the afferent impulse in the following passage. Harvey asks whether the nerve which is sensitive is the same as that which is motive, or is it a different nerve. "And if it is the same nerve, is the movement in these nerves originated by the brain and does it return along with sensation to the brain like something which starts from the beginning and returns back to the beginning again, see Aristotle's triangle?" (*D.m.l.* 101.) Elsewhere he compares the nerve-impulse to the ebb and flow of the sea (*P.* 94c.). Harvey was clearly dissatisfied with the idea of a substantial "spirit" flowing in the nerves. His comment on this hypothesis is: "I think: the spirit does not travel in the nerves, but irradiates and becomes action, whence feeling and movement, like light in air" (*P.* 94c.). Later, in his "second disquisition to John Riolan,"¹³ he completely rejects the idea of spirits as playing any part in physiology.

On the perception of movement he observes: "There is movement which we do not feel as that of the intestines. Nor do we feel the movement of the muscle but of the joints. Thus we perceive and we feel the fingers to move, but truly we neither perceive nor feel the movement of the muscles which are in the elbow" (*D.m.l.* 45). This view has only recently been established as physiologically correct.

When he considers perception, Harvey enters the sphere of psycho-physiology. "We have," he says, "consciousness in ourselves of five principal senses, by which we judge of external objects; but we do not feel with the same sense by means of which we are conscious that we feel—seeing with our eyes, we still do not know by them what we see, but by another sense or sensitive organ, namely the internal common sensation or common sensorium, by which we examine those things that reach us through each of the external sensoria, and distinguish that which is white from that which is sweet or hard. Now this sensorium commune to which the species or impressions of all the external instruments of sensation are referred, is obviously the brain, which along with its nerves and the external organs annexed, is held and esteemed to be the adequate instrument of a sensation. And this brain is like a sensitive root to which a variety of fibres tend, one of which sees, another hears, a third touches, and a fourth and a fifth smell and taste" (*D.g.* 432).

Harvey accepted Aristotle's view of the formation of universals from sensations. "Universals," he wrote, "are first imbibed from particulars by the senses and in so far are only known to us as an universal is a certain whole and indistinct thing, and a whole is known to us according to sense. For though in all knowledge we begin from sense, because, as the philosopher quoted (Aristotle) has it, sensible particulars are better known to sense, still the sensation itself is an universal thing. For, if you observe rightly, though in the external sense the object perceived is singular, as, for example, the colour which we call yellow in the eye, still when this impression comes to be made an abstraction, and to be judged rather than understood by the internal sensorium, it is an universal" (*D.g.* 155).

In discussing the stimulus to movement Harvey relies almost entirely upon Aristotle. "The living creature is moved by appetite or choice when some alteration has been set in motion on the occasion of sensation or imagination" (*D.m.l.* 35). But Harvey adds an idea of his own, for while Aristotle believed that appetite and the object of appetite cause movement when they themselves are moved, Harvey adds: "This is particularly true in the case of appetite, for it is by reason of an alteration which is set in motion that a living creature is made to have an appetite for this thing or for that" (*D.m.l.* 37). Harvey thought, moreover, that the pursuit of a desirable object or the avoidance of an unpleasant one was linked with some change in the body in the direction of heat or cold. This seems to have been the result of observation that changes of temperature in the body or its parts occur with changes of emotion, and also perhaps of the more general idea that heat and cold themselves symbolized positive and negative energy.

Anatomy and Functions of the Brain

Harvey's knowledge of the anatomy and functions of the brain is set out chiefly in the last part of the *Prelectiones*, the notes for his lectures on anatomy. The only published version of these is the transcription published by the College in 1886. Harvey's notes photographically reproduced in this volume are written in what Aubrey¹⁴ calls his "very bad hand" in a mixture of his "very bad Latin"—to quote Aubrey again—and English, sometimes used, I suspect, when he did not know the Latin equivalent. To add to the reader's difficulties he introduces his own abbreviations,

and punctuation is often lacking. It is not surprising that the published transcription is not always accurate. I do not claim that my own translation is entirely so, but I have included only those passages which seem to me reasonably free from doubt. Harvey's account of the naked-eye anatomy of the brain is systematic, clear, and on the whole accurate as far as it goes. He begins with the skull, and debates many questions of interest with which I have not time to deal. He discusses facial appearances, and mentions the association of a small head with a fleshy face and long jaws like a horse (P. 88c.)—perhaps acromegaly.

He notes the two tables of the calvarium and that it varies in thickness "VH whence caution in trepanning one side being through before the other. Whence not when the brain swells." He describes two meninges, the dura and pia mater, including the arachnoid in the latter, and gives a detailed description of the dural sinuses. This leads him to a discussion of the pulsation of the brain, which some attributed to the sinuses. "Laurentius," says Harvey, "says that those who do not think so are mad. VH I am mad" (P. 90). Harvey's view is that the pulsation comes from "the arteries and spirits, consequently the whole brain looks like a quagmire." He notes that coughing makes the brain swell. He gives a good account of the cerebral ventricles, but is sceptical of the traditional attribution to them of mental faculties. "Is the substance of the brain or the ventricle the chief part? I have seen ventricles full of water" (P. 92c.). Those who attribute imagination and intellect to the ventricles "would put the soul, the divinest faculty in prison and mingle the highest things with excretions" (P. 93). "Memories, if functions of the brain, are in the substance, as conserving better" (P. 94).

Commenting on the division of the brain into right and left hemispheres, Harvey says that it is remarkable that a lesion of the right hemisphere should cause paralysis on the left side, and conversely (P. 91c.). His observations on neuropathology are scanty and often difficult to interpret. He was familiar with hydrocephalus and quotes a case of Dr. Argent's in which, he says, the whole brain had been absorbed and there was nothing left but meninges (P. 92c.). He notes the relationship between apoplexy and lesions in the neighbourhood of the ventricles, and describes his own observations in cases of apoplexy in which he has found a substance "like chopt brann, like a little Poridg" (P. 93)—perhaps the softening of infarction. He also mentions distension of the cerebral veins. Epilepsy, he says, is believed to originate in the region of the cerebral ventricles "either when an abundance of matter there acts as an irritant or, as others think, when the spirits contained there are too little agitated" (P. 93). We are still discussing whether constitutional epilepsy is a disturbance originating in the neighbourhood of the ventricles, and if so whether it is a manifestation of too much or too little nervous activity. "Convulsive movements," he says, "are occasioned by disease and are outside the senses and command of the soul and arise from an affection of the spirit" (D.m.l. 149); by which, of course, he means what we should now call the nerve impulse, and not the psyche.

Harvey as a Clinical Neurologist

Harvey's observations on patients suffering from nervous disease have to be gleaned chiefly from notes

made in illustration of points of anatomy and physiology in his writings. He was familiar with changes in the size of the pupils, for he mentions Galen's observation that when one eye is shut the pupil of the other is seen to be dilated (D.m.l. 109). He also mentions constriction of the pupils (ibid. 69), and Galen's idea that the decussation of the optic chiasma is to prevent double vision. He noted that "if the nerve is compressed at the olecranon, two fingers become numb, if a nerve is compressed in the hip the whole leg becomes numb, and is deprived of sensation but not of movement" (D.m.l. 103). He gives a classification of gaits which is graphic but does not always enable them to be identified (D.m.l. 53). A gait like "a crane" may perhaps be a steppage gait. "Ambling Turk" and "trotting servile" may be descriptions of Parkinsonism. "Tripping on the toe, cork shoes" suggests spastic paraplegia, and "stamping on the feet" is still used to describe the gait in tabes. When he says that the obese "waddle like a puffin" (P. 7c.) he is probably recalling his visit to the Bass Rock, of which he gives the graphic description of a true bird-lover (D.g. 208).

The title of Chapter 19 of the *De motu locali animalium* is "Of the affections of muscles, or of the distorting of movement." The classification of these could at that time have little scientific basis, but Harvey's list contains some points of interest. Item 1 is "paresis: dead palsy"; item 2 is "tremor: shaking palsy." Item 3 is "convulsion," and here he differentiates epileptics, hysterics, and children. Item 4 covers "contraction of the limbs as of the legs in scurvy," and he also mentions "arching of the body backwards or forwards as in tetany." Other disorders mentioned are cramp resulting from excessive purging; "twinges, palpitation, convulsion from twitches accompanied by slight pain and pricking or by none, ΔVH particularly Mr. Rant's eye."

Harvey was obviously particularly interested in Mr. Rant's eyelid, which he mentions on several occasions. Mr. Rant appears to have suffered from either blepharospasm or facial myoclonia, for Harvey says: "In Rant's eyelids . . . there is contraction towards the centre" (D.m.l. 103).

He gives a good description of muscular fasciculation as "a pulsing or spirituous palpitation when either the skin or the muscle is first raised up and then depressed as in boiling or undulating movement." Finally he groups together "restlessness, persistent tossings, sleepwalking, harmful position in bed, mania, St. Vitus's dance" (D.m.l. 125).

These clinical observations are inevitably fragmentary. There is, however, one more detailed account of a neurological disorder, which better shows us Harvey as a clinical observer. This is the case of:

"A young woman who during labour fell into so profound a state of coma that no remedies had power to rouse her, nor was she in fact able to swallow. When called to her, finding that injections and other ordinary remedies had been employed in vain, I dipped a feather in a powerful sternutatory, and passed it up the nostrils. Although the stupor was so profound that she could not sneeze, or be roused in any way, the effect was to excite convulsions throughout the body, beginning at the shoulders and gradually descending to the lower extremities. As often as I employed the stimulus labour advanced, until at last a strong and healthy child was born, without the consciousness of the mother, who still remained in a state of coma" (D.g. 534).

As a clinical observer, too, he was keenly interested in the facies and bodily conformation. He recognized three types of dwarf, commented on the association of obesity and somnolence in boys, and described exophthalmos, the eyes being in some patients prominent, moist, and relaxed, giving them a merciful and compassionate appearance associated with ready lacrimation.

Hunter and Macalpine¹⁵ have discovered an account by Harvey of a patient with the symptoms of syringomyelia. Digby¹⁶ quotes Harvey's description of this patient as evidence in favour of the view that there are separate nerves for sensation and movement. He was "a servant in the colledge of Physitians in London, whom the learned Harvey (one of his Masters) hath told me, was exceeding strong to labour, and very able to carry any necessary burthen, and to remove things dextrously, according to the occasion: and yet he was so voyd of feeling that he used to grind his handes against the walles, and against course lumber, when he was employed to rummage any; in so much, that they would runne with bloud, through grating of the skinne, without his feeling of what occasioned it." This must have interested Harvey as supporting his observation, which I have already quoted, that pressure on a nerve might abolish feeling but not movement.

That Harvey recognized that such loss of sensation might be hysterical is indicated by a patient described by Hollyer to Boyle¹⁷ and also discussed by Hunter and Macalpine. This patient "was a Maid of about 18 Years of age, who, without the loss of motion, had so lost the sense of feeling in the external parts of her Body, that when he had, for tryal's sake, pinn'd her Handkerchief to her bare Neck, she went up and down with it so pinn'd, without having any sense of what he had done to her." Harvey, Boyle reports, went to see her out of curiosity, and thinking her disorder to be uterine, recommended marriage, by which "she was, according to his Prognostick, and to many Men's wonder, cur'd of that strange Disease."

Harvey in the *Prelectiones* mentions "Nan gunter etc. puto callum fecisse the mad woman pins in her arme" (P. 11c.). Nan, or Anne Gunter attracted considerable attention because she was suspected of being possessed by the Devil (Hunter and Macalpine).¹⁸ The Bishop of London referred her to the College for investigation. Dr. Wilkinson, Dr. Dunne, and Dr. Argent were appointed to do this (*Annals*, March 4, 1604/5). Unfortunately their decision is unknown, but King James I, who as the author of *Daemonologie*¹⁹ was an expert on this subject, now intervened. He referred her for an opinion to Dr. Edward Jorden, a Fellow of the College, and then sent for her himself and by using psychological methods succeeded in curing her. And "the King giving her a Portion, she was afterwards married, being by this subtle artifice perfectly cured of her mimical Witchery"—an example of the royal touch in reverse. The fact that the King extracted from her a confession that she had only pretended to be a witch is not inconsistent with her having been a hysteric.

Harvey accepted the current view that hysteria was uterine in origin, but it would be a mistake to interpret this idea in an exclusively anatomical sense. Jorden, Harvey's older contemporary in the College, was the author of a book, called *A Briefe Discourse on a Disease called the Suffocation of the Mother*, which he dedicated

to the President and Fellows. By this rather strange title he meant the uterine origin of hysteria, and his main thesis was that hysteria was not due to diabolical possession. Though he stressed the importance of uterine disorders, a substantial part of his book is devoted to showing that hysteria may have a psychological cause and respond to psychological treatment. for "the perturbations of the mind are often to blame for this and many other diseases."

Harvey's practice as an obstetrician and gynaecologist led him to lay some stress upon the uterus itself. He thought that a wide range of psychological disorders in women could be attributed to displacements of the uterus. Paradoxically, he reports two cases in which psychological disorders, in one melancholy and in the other hysterical symptoms of long standing, were cured by uterine prolapse, but remained well after he had replaced the womb (*D.g.* 542-3). He also describes two cases of pseudocyesis (*D.g.* 528-9): the symptoms, he says, depended on flatulence and fat. Also, however, he clearly recognized the psychosexual origin of some nervous disorders.

Psychosomatic medicine does not seem to have been very different in Harvey's day from our own.

"Hence the stomach answering to the face
the wasted face of the valetudinarian
they feel an alteration after every article of diet
they accumulate wind greatly on account of their size
that is to say they generate it and cannot expel it
on account of their weakness" (P. 28c.).

And here is a cry from the heart which will evoke many an echo to-day.

"There are many always complaining Lady Croft." (P. 19).

The "Ocular Philosopher"

I have shown you William Harvey as a neurologist. not to suggest that he contributed anything original to neurology, but to illuminate him as, in Sir Thomas Browne's²⁰ phrase, the "ocular philosopher," a great observer, alike of man and of nature, and a thinker whose intuition saw when traditional ideas were outmoded, even though he did not always know how they were to be replaced. And since his vision embraced the whole of life he was, as I began by saying, a comprehensive man. Let me in conclusion illustrate from his writings both his comprehensiveness and his prevision.

"Our common cock, whose pugnacious qualities are well known, as soon as he comes to his strength and is possessed of the faculty of engendering, is distinguished by his spurs, and ornamented with his comb and beautiful feathers by which he charms his mates to the rites of Venus, and is furnished for combat with other males, the subject of dispute being no empty or vain-glorious matter, but the perpetuation of the stock in this line or that, as if nature had intended that he who could best defend himself and his should be preferred to others for the continuance of his kind" (*D.g.* 425). Now listen to Darwin.²¹ "Thus the most vigorous females, which are the first to breed, will have the choice of many males and . . . will select those which are vigorous and well armed, and in other respects the most attractive . . . and this apparently has sufficed during a long course of generations to add not only to the strength and fighting powers of the males but likewise to their various ornaments or other attractions."

Now here is Harvey reflecting on the origin of the individual life, and seeking a parallel between the formation of the embryo and cerebral function. He asks: "whether the conception of the uterus be of the same nature or not with the conceptions of the brain, and fecundity be acquired in the same way as knowledge—a conclusion, in favour of which there is no lack of arguments; or, as motion and the animal operations, which we call appetites, derive their origin from the conceptions of the brain, may not the natural motions and the operations of the vegetative principle, and particularly generation, depend on the conception of the uterus?" (P. 372). This may sound a little like one of Sir Thomas Browne's fancies, but here is the answer of a present-day physicist:

"In the adult organism the information appears as macroscopical structural and functional complexity. In the germ cell it must evidently take the form of chemical complexity of the macro-molecules with which the genes are associated . . . Structural modification of protein molecules in the brain tissue . . . is equivalent to the prescribed storage of information in the chromosomes of the germ cell."²²

The title "Ocular Philosopher" brings together the vision and the thought, so I venture to end with some lines which I wrote when I was President, suggested partly by the Harvey portrait in the library, and partly by Aubrey's words: "He did delight to be in the darke, and told me he could then best contemplate. He had a house heretofore at Combe, in Surrey, a good aire and prospect, where he had caves made in the earth, in which in summer time he delighted to meditate."

In cave like Plato's Harvey saw
Life's shadows moving in his mind,
And with its light dispersed the blind
Imposture of tradition's law.

Darkness and light dwell in those eyes,
Whose gaze discerned the heart's intent—
The blood's benign encirclement—
And learned in darkness to be wise.

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FIELD TRIAL OF INFLUENZA VIRUS VACCINE IN PATIENTS WITH CHRONIC BRONCHITIS DURING THE WINTER 1957-8

REPORT BY THE JOINT WORKING PARTY OF THE MEDICAL RESEARCH COUNCIL'S COMMITTEE ON INFLUENZA AND OTHER RESPIRATORY VIRUS VACCINES AND OF THE RESEARCH COMMITTEE OF THE BRITISH TUBERCULOSIS ASSOCIATION*

The acute exacerbations of the symptoms of bronchitis which occur in patients with chronic bronchitis and emphysema are a major cause of illnesses in general practice and are often responsible for sudden increases in demand for emergency admission to hospital (Abercrombie, 1956). Peaks of mortality from bronchitis are known to be related sometimes to environmental conditions such as smogs, but may also coincide with influenza epidemics (Reid, 1956). There is evidence both from serological studies and from the recovery of influenza viruses that these agents are sometimes the cause of infective exacerbations of illness in patients with chronic bronchitis (Stuart-Harris and Hanley, 1957). Yet the relative importance of influenza

*The planning subcommittee consisted of the following members: Dr. J. G. Scadding (chairman), Professor J. Crofton, Drs. C. M. Fletcher, J. C. McDonald, G. P. Maher-Loughnan, W. J. Martin, Professor C. H. Stuart-Harris, and Brigadier A. E. Richmond (Secretary).

The report was prepared by Brigadier A. E. Richmond and Dr. G. P. Maher-Loughnan.

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