

structure of the arms and the bar, and the mode of connection of the parasite through these arrangements to the wall of the nasal chamber of the skate. The structure of two bulb-like protuberances from the sides of the cephalo-thorax, immediately in front of the roots of the arms, was then described. These were the eye-like spots of Retzius and Kröyer.

Abdomen $\frac{7}{10}$ ths of an inch long, $\frac{4}{10}$ ths broad; had an inverted heart-shaped form; imperfectly defined segmented appearance. The fourth segment, the largest, possessed a median slit-like anal aperture, two elongated ova strings, and two posterior abdominal appendages. The arrangement of the intestinal canal, ovaries, and cement organ was then described. The authors then pointed out certain appearances which they considered indicative of the existence of a nervous system.

The authors agreed with Milne-Edwards in thinking that the elongated cephalo-thorax and the posterior abdominal appendages point decidedly to the advisability of separating this animal from the genus *lerneopoda*. None of the specimens they examined had the male attached, so that they have not examined it. They have seen the larvæ in various stages of development. When free, the larva was $\frac{1}{37}$ th of an inch long and $\frac{1}{60}$ th of an inch broad; oval when viewed from dorsal surface; profile view showed a convex dorsal and almost flat ventral surface. It possessed a pair of antennæ and two pairs of limbs. Each of the first pair of limbs was bifid, the two branches bearing long hairs at their extremity. Each of the second pair was bifid, the two branches bearing each a spinous hook at its extremity. A remarkable tail-like prolongation, fringed with pinnate hairs, was then described. The curved intestinal canal, the eye spots, and the pigment masses within the visceral chamber, were then adverted to.

2. *Memoir of the Life and Writings of Robert Whytt, M.D., Professor of Medicine in the University of Edinburgh, from 1747 to 1766. By William Seller, M.D., F.R.S.E., F.R.C.P.E.*

Biography, the author said, had never done sufficient justice to Robert Whytt, while it began already to omit his name. Whytt had commonly been represented as a follower of Stahl; and this

idea, which was without foundation, had probably been a principal cause why his merits had not always been duly recognised.

It was mentioned in the Memoir, that Whytt was born at Edinburgh, September 6, 1714; he was the son of Robert Whytt of Bennoch, a member of the Scottish bar; he was a posthumous child, born six months after his father's death; he was not yet seven years old when he lost his mother; her name was Murray; she was the daughter of Antony Murray of Woodend, in Perthshire. Whytt was sent, when still very young, to the University of St Andrews, where at the early age of sixteen he took the degree of Master of Arts. When fourteen years old he succeeded, by the death of his elder brother, to the family estate. He had two sisters, who were married, and had descendants. In 1730 he repaired to Edinburgh to study medicine; and there is still extant a manuscript book of notes taken by him at that period from the lectures of George Young. After three or four years devoted to medicine at Edinburgh, he proceeded to London, where he became the pupil of Cheselden; thence to Paris, where he studied anatomy under Winslow; and thence to Leyden, where Boerhaave and Albinus were his preceptors. Finally, in 1736, he took the degree of Doctor of Medicine at Rheims. On his return to Scotland the University of St Andrews spontaneously conferred on him the same medical honour. Having become a fellow of the Edinburgh College of Physicians, he commenced practice, and even at so early an age he is said to have had much success. Soon after he married Miss Robertson, who is described as the sister of General Robertson, Governor of New York. By this lady he had two children, who died in infancy. Her death followed soon after. In 1743 he married Louisa Balfour of Pilrig, whose brother afterwards became Professor of Moral Philosophy in the University of Edinburgh. By this lady he had fourteen children, six of whom survived him. His second wife died in 1764, two years before himself. Whytt suffered severely from ill health for fifteen months before his death, which took place, April 15, 1766. A post-mortem examination showed extensive effusion in both cavities of the pleura, some disease in the mucous membrane of the stomach, and concretions in the pancreas.

Whytt's first work, "On the Virtues of Lime-Water and Soap in the cure of Stone," was published in the Edinburgh Medical Essays

for 1743. It subsequently went through several editions, and was translated into French and German. Though time has rendered a great part of this work obsolete, it still merits a distinguishing mark in the history of science, since Dr Black has left it recorded, that it was the controversy between Whytt and Alston respecting the most solvent kind of lime-water, which led him to the examination of calcareous earth, magnesia, the alkalies, and fixed air, whence he obtained conclusions that placed chemistry within a short period of their date on a wholly new and extended footing.

Whytt's next work, published in 1751, "On the Vital and other Involuntary Motions of Animals," fixed the attention of physiologists throughout Europe on its author. His more practical work "On the Sympathy of Nerves and on Nervous, Hypochondriac, or Hysteric Disorders," published in 1764, is a commentary on the former, and a practical illustration of its doctrines. Whence in the present summary both works are considered together, though in the Memoir itself each work is separately treated of.

The first object of the Memoir, under this head, is to show by sufficient proofs that Whytt was not a follower of Stahl,—that he was no more an Animist or Semianimist, than the major part of physiologists at the present moment,—that while Whytt conceived it more conducive to simplicity to represent his sentient principle as a part of the soul, he expressly declares it to be superfluous to dispute with any one who holds doubts thereon, because all his views are independent of that idea, and possess the same truth, whether the sentient principle be or be not accounted a part of the soul. Further, that this sentient principle being destitute of reason, intention and consciousness is really nothing but a physiological force, united with the nervous centre, susceptible of being so far excited by impressions brought by the afferent nervous fibrils, as to communicate motor force to the efferent nervous fibrils which proceed to contractile organs. That such is exactly the light in which Cullen places Whytt's doctrine, referring to Whytt's own expression, that under the appropriate impressions, the power is as certainly determined to bring about these motions, "as is a scale which, by mechanical laws, turns with the greatest weight." That notwithstanding the denial of any consciousness in the case, it is true that the term sentient, and the quality of ungratefulness ascribed to the impressions concerned, create a confusion of ideas; but that that difficulty had

its source in the want of appropriate words (greater in Whytt's time than now) to express the effect of physical agents on organic tissues. That there has always prevailed in physiology a tendency to express in a term not merely the property, but the cause of that property, which is exemplified in the contrast between the nearly synonymous words contractility and irritability,—the former signifying nothing more than the susceptibility of contraction, while the latter, the older word, bears reference to the cause of that susceptibility. That the idea attached by Whytt to “sentient principle,” while he denies that it involves consciousness, may be gathered by some consideration of what dwelt in Glisson's mind, when, speaking of the obvious effect of impressions on the spinal cord in animals after decapitation, he says the cord perceives without sensation.

The Memoir referring to the contrast between the effect of a drop of boiling water suddenly falling on the naked foot, and the effect of the sight of a drop of boiling water about to fall on the naked foot, points out that in the latter case the foot is moved by an intelligible force, namely, a volition, but in the former case, by a latent force, which is what Whytt calls his sentient principle. Further, if it be said, why introduce any force, sentient or not sentient, where nothing is by any research discoverable, that Whytt felt himself obliged by the usage of his age to invent an hypothesis, that some force might seem to intervene between the impression on the afferent nerve and the motor power imparted to the efferent nerve; and that if he had felt himself at liberty to omit this hypothesis, his view would have been in general terms exactly that of the present day,—namely, that impressions made on the peripheral extremities of afferent nerves are reflected through the nervous centre into motor influence, transferable by efferent nerves to contractile organs. Again, that the modern view does not reject the idea of a force intervening between the impressions and the reflected motor influence, but merely omits all mention of it, because the connection between the impression and the subsequent motion is not spoken of in relation to cause and effect, but merely as the observed law of an antecedent and consequent, whence that Whytt's mode of thinking does not in general terms differ from the modern view, except that he attempted to solve a difficulty which the modern view declines to meddle with.

The Memoir, however, affords another reason why Whytt felt

obliged to interpose an active cause between the impression on the afferent nerve and the motor influence in the efferent nerve, inasmuch as no consistent attempt had then been made to assign separate offices to particular parts of the nervous centre; and the idea that a part of the tissue of the nerves and brain (such as the white fibres in both), might be merely conducting cords, while another part, such as the grey substance, might be the exclusive origin of force, had not then arisen, whence, as he himself states, that his view was unsatisfactory to explain why an afferent nerve bringing an impression from an external part to one point of the nervous centre, should have its effect reflected into an efferent nerve arising at a distant point of the same centre, unless some influence pervading the whole nervous centre, and therefore the space between the two nerves, were the exciting force, such as his sentient principle.

The Memoir further shows, that though Whytt did not attempt to assign separate offices to separate parts of the nervous centre, understood as including the encephalon and spinal marrow, yet, when explaining the movements in decapitated animals, he suggests the idea that the spinal cord may be capable of independent action, as in tortoises, which live months after being deprived of the brain; while it also affords proof that though Whytt made no pretensions to improve the anatomy of his age as respects the nervous system, he was the authority referred to for seventy years for the hypothesis now recognised as an important fact,—namely, that the ultimate fibrils of the nerves, amidst all their combinations into cords, plexuses, and the like, pass unbranched and isolated from their origin to their termination. Again, it is maintained that this hypothesis could not fail by a single step to suggest the division of the nervous system into conducting cords and centres of force, and therefore to lead to the perception of the probable analogy between the ganglionic system in the invertebral animals and the nervous centre in the vertebrata.

The sum of Whytt's view is next exhibited in the Memoir in contrast with the matured state of the same doctrine in the present day, in as far as regards the non-vital involuntary movements,—viz., the closing of the pupil under a strong light; the shutting of the eyelid when the eye is threatened; the adjustment of the membranes of the internal ear by the muscles of the tympanum to the variations of sound; the act of respiration, and its modifications,

sneezing, cough, hiccup, vomiting, deglutition, the evacuation of the bowels and bladder, and such acts as the sudden withdrawal of the foot when a drop of boiling water falls on it. It is further shown that in such acts generally, there is a consciousness of the impression and a consciousness of the muscular act determined by it, but that there is no consciousness of the exercise of any intervening power; or of the effect of what Whytt terms the sentient principle. It is further stated, that while the discovery of numerous before unnoticed relations between the several parts of the nervous system has largely explained the conformation of the nervous organism, there has not been a corresponding advance in the knowledge of the activities therein operative, so that the same forms of expression are applicable to Whytt's system and to the matured state which his views have now assumed.

The Memoir goes on to state that Unzer was the first who followed Whytt in such a mode of considering nervous action; that while it is acknowledged that Unzer's book is one of great ability, it is a mistake to think that his reflex action of nerves is an advance upon Whytt's,—that it is, on the contrary, retrograde, as the reflex action which he describes is made dependent on communications of nerves in their course analagous to the explanation given by Willis of sympathy. That Prochaska did make a considerable advance; that reflex action in his hands has its seat in the common sensorium or cranio-spinal axis, or excludes the cerebrum and cerebellum, while he describes it as a law written on the medullary pulp of the sensorium,—that is, he ascribes it to no principle or force, though his expression implies the latent existence of such a principle or force. That Marshall Hall is entitled not only to the credit of having given a new impulse to the study of this part of physiology, but of having made the great advance of showing that each segment of the spinal cord and *medulla oblongata* possesses a separate power of imparting reflex action to the nervous fibrils which originate in it, whenever certain impressions are brought to that segment by afferent nerves which terminate there.

In reference to Whytt's views of sympathy which belong to the second of the works mentioned before, his sympathetic actions come under the same head as the non-vital involuntary motions, or depend on impressions reflected into motions through the nervous centre. The sympathetic sensations are either the result of mental

states acting on the nervous centre, and thence on nerves of sense, or sensations produced through one set of nerves reacting on other nerves of the same character. The latter idea is manifestly the same as what in modern times has been termed the radiation of sensation.

With respect to Whytt's controversy with Haller, and the several papers published thereon, it referred to the dependence or non-dependence of irritability, now termed contractility, on nerves,—the former opinion being maintained by Whytt, the latter by Haller. This subject was largely experimented on by Whytt, whose mode of thinking gained many converts in his own time and in subsequent years. It has happened, however, that Haller's views in this particular prevail at the present time, with this understanding,—that though the contractility of the organs concerned in the vegetative functions is not regarded as dependent on nerves, yet the organs of all such functions are believed to be very largely modified by an influence derived from nerves.

As the Memoir itself is of considerable length, and is mainly devoted to the elucidation of the two works above referred to, what has just been said gives but an imperfect idea of the entire character of these principal works of Whytt.

The Memoir concludes with some notice of his other papers, and in particular with a short view of his posthumous work on acute hydrocephalus, on which, in several particulars, he is an original authority.

3. On a difficulty in the Theory of Rain. By James Dalmahoy, Esq.

The difficulty which the paper discusses is the paradoxical fact discovered by Dr Heberden,—namely, that if there be three exactly similar rain-gauges, and one of them be placed on the ground, the second on the roof of a neighbouring house, and the third on a still higher edifice, then, notwithstanding every variety in the positions of these gauges as respects surrounding objects, and notwithstanding the prevalence of the opposite conditions of high wind and of absolute calm, it is observed that the lowest gauge receives more rain than the middle one, and the middle gauge more rain than the upper one.

The paper endeavours to show the inadequacy of the explanations