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JOSEPH LEIDY.<sup>1</sup>

BY

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Joseph Leidy<sup>2</sup> was born in Philadelphia, there he passed his three-score years and ten, and there he died. For forty-five years he was an officer of the Philadelphia Academy of Natural Science, and a professor in the University of Pennsylvania for forty years. His character was simple and earnest, and he had such a modest opinion of his talents and of his work that the honors and rewards that began to come to him in his younger days, from learned societies in all parts of the world, and continued to come for the rest of his life, were an unfailing surprise to him.

His knowledge of anatomy, zoölogy, and botany, and mineralogy was extensive and accurate and at his ready command. Farmers and horticulturists came to him and learned how to check the ravages of destructive insects; physicians sent rare or new human parasites and were told their nature and habits and the best means of prevention; jewelers brought rare gems and learned their value. His comments, at the Academy, on the recent additions to its collections, gave a most impressive illustration of his ready command of his vast store of natural knowledge.

Leidy wrote no books, in the popular meaning of the word. He undertook the solution of no fundamental problem of biology. There are few among his six hundred publications that would attract unscientific readers or afford a paragraph for a newspaper. They are simple and lucid and

<sup>1</sup>An address delivered on the occasion of the unveiling of ten busts of American men of science at the American Museum of Natural History, New York, December 29, 1906.

<sup>2</sup>That anatomists recognized the value of Leidy's work in the field of anatomy, as well as the high character of his influence on the active investigators of his time, is illustrated by his election to the first presidency of the Association of American Anatomists in 1888. He took an active part in the organization and work of the society until his death in 1891.—EDITOR.

to the point. Most of them are short, although he wrote several more exhaustive monographs. They cover a wide field, but most of them fall into a few groups. Many deal with the parasites of mammals—among them, one in which his discovery of trichina in pork is recorded.

Two hundred and sixteen, or about a third, of his publications are on the extinct vertebrates of North America. His first paper on palæontology was published in 1846, and his last in 1888, as the subject occupied him for more than forty years. He laid, with the hand of a master, the foundation for the palæontology of the reptiles and mammals of North America, and we know what a wonderful and instructive and world-renowned superstructure his successors have reared upon his foundation. It was this work that established his fame and brought him honors and rewards. They who hold it to be his best title to be enrolled among the pioneers of science in America, are in the right in so far as the founder of a great department of knowledge is most deserving of commemoration; but I do not believe it was his most characteristic work.

I can mention but one of the results of his study in American fossils. He showed, in 1846, that this continent is the ancestral home of the horse, and he sketched, soon after, the outline of the story of its evolution which later workers have made so familiar.

More than half his papers are on a subject which seems to me to contain the lesson of his life. Like Gilbert White, he was a home-naturalist, devoted to the study of the natural objects that he found within walking distance of his home, but he penetrated far deeper into the secrets of the living world about him than White did, finding new wonders in the simplest living being. In the intestine of the cockroach, and in that of the white ant, he found wonderful forests of microscopic plants that were new to science, inhabited by minute animals of many new and strange forms. His beautifully illustrated memoir on *A Flora and Fauna Within Living Animals* is one of the most remarkable works in the whole field of biological literature. Another memoir gives the results of his study of the anatomy of snails and slugs. The inhabitants of the streams and ponds in the vicinity of his home furnished an unfailing supply of material for research and discovery, and many of his publications are on aquatic animals. He finally became so much interested in the fresh-water rhizopods that he abandoned all other scientific work in order to devote all his attention to these animals. His results were published in the memoir on *The Fresh-water Rhizopods of North America*. This is the most widely known of his works. It is, and must long be, the standard and classic upon its subject. I have no time to

dwell upon his work as the naturalist of the home—his best and most characteristic work. Its lesson to later generations of naturalists seems to me to be that one may be useful to his fellowmen, and enjoy the keen pleasure of discovery, and come to honor and distinction, without visiting strange countries in search of rarities, without biological stations and marine laboratories, without the latest technical methods, without grants of money, and, above all, without undertaking to solve the riddles of the universe or resolving biology into physics and chemistry.

If one have the simple responsive mind of a child or of Leidy, he may, like Leidy, "Find tongues in trees, books in running brooks, sermons in stones, and good in everything."

### INVESTIGATIONS.

A PRELIMINARY NOTE UPON SOME CHARACTERISTICS OF THE VENOUS SYSTEM OF *TRAGULUS MEMINNA* AND ALLIED GENERA, by Frank E. Beddard, M. A., Oxon., F. R. S., *Prosector of the Zoölogical Society of London*.

I have recently seen, through the kindness of the author, an account by Prof. McClure of the post caval vein of the Indian Chevrotain, *Tragulus meminna*.<sup>1</sup> It appears from that gentleman's notes that *Tragulus* presents a condition of the postrenal region of the postcaval vein which is only paralleled elsewhere among the Mammalia by the genus *Dasypus*, by the majority of the Marsupials, and by both *Echidna* and *Ornitho rhynchus*. This is particularly interesting in view of the admittedly low position which *Tragulus* occupies in relation to other Artiodactyles. In the animals in fact referred to the postcaval vein behind the entrance of the renal veins lies ventrally to, and accurately covering, the aorta, instead of lying to the right side and dorsal to that artery. This position of the postcava is associated, as Prof. McClure's researches<sup>2</sup> into the development of *Didelphys* inform us, with a different origin of the postrenal section of the postcava. Prof. Hochstetter has noted<sup>3</sup> and described the same state of affairs as an abnormality in an example of the common cat, and Prof. McClure, therefore, was unable to assert

<sup>1</sup> The Postcava of an Adult Indian Chevrotain (*Tragulus meminna*, Erxleben), Anat. Anz., Bd. XXIX, 1906, p. 375.

<sup>2</sup> A Contribution to the Anatomy and Development of the Venous System of *Didelphys marsupialis* (L.), Am. Journ. Anat., 5, 1906.

<sup>3</sup> Beiträge zur Entwicklungsgeschichte der Amnioten III. Säugethier-Morph. Jahrb. XV, 1893.

that the conditions which he described in *Tragulus meminna* were not also an abnormality. Upon this question he writes as follows: "As only one specimen of *Tragulus* was examined one cannot be certain that the postcava in this particular case represents the normal conditions; whether it be normal or abnormal, however, the type of postcava presented by the single specimen is certainly unusual for Ruminants, and, so far as is known to the writer, has not been hitherto recorded as occurring in the same." It is evident, therefore, that the settlement of the question of normality or abnormality in the conditions of this vein is of some little importance. I find from an examination of three examples of *Tragulus meminna* that Prof. McClure has made a contribution to Mammalian anatomy and has not merely recorded an abnormality. Two of these examples were adults, the one a male and the other a female. The third individual was a young male, nearly if not quite ready for birth, which was extracted from the uterus of the mother after death. In all three specimens the relations of the veins and arteries concerned were precisely as figured by McClure, so much so that I have not thought it worth while to introduce a figure of my own. I may take this opportunity of remarking that the resemblance which the postcava of the Armadillos bears to *Tragulus* and the other types mentioned above is not limited to the genus *Dasypus* in which the facts have been recorded by Hyrtl and Hochstetter. I have lately dissected *Tatusia kappleri* and find precisely the same arrangement. There is another matter concerning the blood vessels of *Tragulus* which is not specially described, but is figured, by McClure. The right kidney receives two veins from the postcava, while on the left side of the body there is but a single renal vein. This is not absolutely a characteristic of the Chevrotain. But in two of the three examples which I have just referred to the veins in question were as figured by McClure. In the third, which happened to be the female, though I lay no stress upon this fact, there was but a single renal vein on each side. *Tragulus* is also remarkable among the Artiodactyle Ungulates by reason of the structure of the azygos vein. Hochstetter in remarking that probably all of these Ungulates were characterized by the possession of a permanent left azygos connected directly with the coronary sinus and not opening independently into the precava doubtless represents current opinion on the matter, and from the same point of view Max Weber in his recent account of the mammalia<sup>4</sup> utilized correctly this condition of the azygos as a feature of the order. I have had the opportunity of dissecting a

<sup>4</sup> Die Säugethiere, Jena, 1904.

considerable number of genera of Aritodactyles, both Ruminants and Pigs, and find that, broadly speaking, the generalization of the two observers mentioned are correct. But *Tragulus* happens to be an exception. In this animal the azygos is only developed upon the right side of the body, the merest traces representing the otherwise missing left azygos. Here again we have an identity in the disposition of the veins in all of the three examples dissected, and indeed they agree in the very tiniest details. That this represents the normal is as certain, I imagine, as can be. In view of the fact that among the Primates and Carnivora and American Edentates (I know nothing of the African and Oriental genera) as well as many Marsupials the right azygos is the only azygos vein properly developed in the adult or at least (Marsupials) is frequently the prevalent azygos vein when there are two, it is not improbable that this persistence of the azygos is the characteristic one among the Eutheria. Nevertheless it is at least equally possible that the retention of the right azygos only may have been independently arrived at more than once. However, so far as regards the Aritodactyles, it is to be remarked that as a general rule, subject it is true to many exceptions, the left azygos opening directly into the heart through the coronary sinus is not the only azygos vein present. For in many Antelopes there is a not inconsiderable right azygos drawing blood from four or five intercostal spaces.

One might expect that the Pig tribe would throw some light upon this matter, but they do not as far as my own knowledge goes. For in the genera *Potamochoerus* and *Phacochoerus* the azygos veins, right and left, are quite typically Artiodactyle. On the other hand the deer tribe have to some extent preserved the conditions characteristic of *Tragulus*. For in *Cervus sika* (but not in *Cervus aristotelis*, which is typically Artiodactyle) the right azygos alone is present and with the relations of that vein in *Tragulus*. It is remarkable that the nearest ally of *Tragulus*, viz., *Dorcatherium*, has azygos veins which conform to the general Artiodactyle plan in that the left is the stronger vein and enters the heart directly. It is not without interest to observe that in this group, Tragulina, which are undoubtedly the most ancient among the Selenodontia, we find in the azygos vein both types which are found in the other more specialized members of the order. The same "prophetic" phase of the azygos is shown in a more striking way in the Subungulate type *Hyrax*. I have examined four individuals of *Hyrax capensis* and find that two of them agreed<sup>5</sup> in the presence of a large azygos on the right side and the

<sup>5</sup> And with two described by George (Ann. Sci. Nat. (6), I, 1874).

absence of anything but traces of a left azygos. In the existence of a right azygos only these individuals resemble the Perissodactyles, at any rate the horse, zebra, and, according to Sir Richard Owen, the Indian Rhinoceros. In a third specimen, and I think in the fourth, a left azygos was also present, opening into the postcava just where that vein enters the heart. In this instance is an obvious approximation to the Artiodactyle. Recent developmental studies upon the azygos (by Hochstetter, Parker & Tozier, McClure) have shown that the azygos is a derivative, as was shown long ago by Rathke, of the postcardinals; but the actual share which the postcardinal takes in the production of the azygos of its side of the body varies in different Mammalia. While in the Rabbit the persistent (right) azygos is formed out of the postcardinal down to the eighth thoracic segment and thereafter is a new structure, the azygos (left) of *Didelphys* is only formed out of the postcardinal at its very commencement. In these cases the rest of the postcardinal disappears in the adult animal, so far that is as concerns the thoracic portion of the same. In all of the four newly-born examples of the Rodent *Myopotamus coypu* the intercostal veins showed some interesting facts which have a bearing upon the origin and nature of the azygos. It is remarkable in the first place that the conditions were identical in all four specimens. There was no variation whatever. In all of them there were three longitudinal veins draining the musculature of the back in the thoracic region. On each side was a vein, much larger on the right side than on the left, which entered the precava and passed to that vein along the junction of the ribs with the centra of the successive vertebræ. Just before entering the precava the right hand vein received an equally strong vein which passed closer to the median dorsal line of the body and was connected by cross anastomoses with the vein already mentioned. In the adult *Myopotamus coypu* only the innermost of the two right hand longitudinal veins remains as the azygos, but there are traces of the outermost right hand vein in the shape of anastomoses between two or three of the successive intercostal branches. In some other Rodents allied to *Myopotamus* there are more extensive traces of the same, amounting in fact to a retention of the two longitudinal veins of the right side. It seems to me to be difficult to avoid coming to the conclusion that we have in the young *Myopotamus* two postcardinals persisting for an unusually long time and an azygos derived from the upper end only of the postcardinal so far as that vein is concerned, and, furthermore, the conclusion seems inevitable that in this animal and probably in certain other Rodents the thoracic intercostal system of veins of the adult is partly

formed of the postcardinal and partly of the azygos, which both persist as parallel longitudinal vessels. Though an unborn example of *Tragulus* showed no trace of any second longitudinal trunk on the right side I have found in *Cervus sika* considerable traces of the same and in other animals also.

THE NASAL SKELETON OF AMBLYSTOMA PUNCTATUM (Linn.), with four plates. By Robert J. Terry. Transactions of the Academy of Science of St. Louis, Vol. XVI, No. 5, December 1, 1906.

The results obtained by Professor Terry may be summarized as follows: The early stages in the development of the nasal skeleton of *Amblystoma* are like those of *Rana* and *Necturus*; the study of the later stages makes it possible to compare the divergent nasal skeletons of the adults. The ethmoidal column is to be regarded as the beginning of the proper nasal skeleton. The other parts, such as the trabecula, trabecular crest, and antorbital process are related from the outset to neighboring structures, as well as to the nasal organs. The ethmoidal column in the animals named, and probably in all Amphibians, grows in adaptation to the olfactory organs, namely, the bulb, nerve, and nasal sac. In connection with it there are formed the greater part of the nasal capsule, the olfactory portion of the lateral wall of the cranium, part of the boundaries of the foramen for the olfactory nerve, and the anterior wall of the cranium, which is in front of the olfactory bulbs. The floor of the nasal capsule of *Amblystoma* is formed in large part by the trabecular horn, the lateral end of which appears to have a primary relation to Jacobson's organ. In *Rana*, a highly developed Jacobson's organ is supported by a floor for the capsule; in *Siren* the organ and floor are probably rudimentary, and in *Necturus* both structures are absent. The ethmoidal column in *Rana* develops in connection with the trabecular skeleton, whereas in *Amblystoma* and *Necturus* it arises independently. In *Amblystoma* the column unites secondarily with the trabecula and so enters into the wall of the brain-case, but in *Necturus* it remains separate from the trabecula and enters only into the formation of the nasal capsule. The independent origin of the ethmoidal column in *Amblystoma* and *Necturus* is regarded as evidence of reduction of the chondrocranium; the adaptation of this column to the nasal sac alone, in *Necturus*, results in its partial re-formation.