

XIII. *Remarks on the voluntary Expansion of the Skin of the Neck, in the Cobra de Capello or hooded Snake of the East Indies.* By Patrick Russell, M. D. F. R. S. *With a Description of the Structure of the Parts which perform that Office.* By Everard Home, Esq. F. R. S.

Read June 14, 1804.

THE remarkable expansion of the skin of the neck, in the Coluber Naja of LINNÆUS, or Cobra de Capello of the East Indies, and which constitutes a principal character of the species, is produced by an apparatus hitherto, as I believe, very imperfectly described. It is a voluntary action, totally distinct from that inflation which all serpents, when irritated, are more or less capable of, and which the Coluber Naja also assumes, at the same time that it expands its hood.

In botanical excursions in India, fragments of serpentine skeletons, made by the black ants, were occasionally met with; but, in such as were supposed to belong to the Coluber Naja, the peculiar disposition and structure of the cervical ribs, so different from that in other serpents, had escaped me.

In other serpents, the ribs, from the first vertebra to those of the middle of the trunk, gradually increase in length; thence they gradually shorten or decline, to near the end of the tail, where they disappear, or are transformed into short eminences; but, in the Coluber Naja, the cervical ribs gradually lengthen to the tenth or eleventh, after which, they successively shorten to the twentieth. The ribs, again increasing in length, are, at the

middle of the trunk, nearly as long as the middle cervical ribs ; and then declining, as usual in other serpents, disappear on the tail.

So obvious a peculiarity in the skeleton of the Cobra de Capello having escaped my notice in India, and finding myself unable to account for the expansion of its hood, which is commonly, in that country, conceived to be connected with inspiration, I brought with me, on my return to England, several subjects for dissection, in order to have the matter properly ascertained. My friend Mr. HOME readily undertook the task ; and the subjoined result of his investigation will, I have no doubt, prove satisfactory.

I have, on another occasion, asserted as a fact, that the neck of the Cobra de Capello, in a quiescent state, shows no external protuberance whatever ;\* and it is clearly accounted for, in the following description, from the ribs, when depressed, lying upon the spine, over one another.

*Mr. HOME'S Description.*

The mechanism by which the Cobra de Capello, when irritated and ready to seize its prey, expands the skin of the neck, giving it the appearance from which the snake takes its name, consists intirely of muscles, acting upon the ribs and external skin of the animal.

From the rounded form of the hood, the skin has the appearance of being inflated ; but the most careful examination did not discover any communication between the trachea, or the lungs, and the cellular membrane under the skin.

In this snake, the ribs nearest the head, to the number of twenty on each side, have a different shape from the rest ; instead

\* Continuation of an Account of Indian Serpents, page 3. Lond. 1801.

of bending equally with the other ribs towards the belly, they go out in a lateral direction, having only a slight curvature, and, when depressed, lie upon the side of the spine, on one another.

The first rib is shorter than the rest; and they become gradually longer to the tenth and eleventh, which are the longest; they afterwards become gradually shorter to the twentieth, which is nearly of the same length as the first; so that the ribs on each side, when extended, form an oval figure, of which the spine is the middle line or long axis.

In the extended state of the ribs, the skin of the back is brought over them, forming the hood; and, in their depressed state, the hood disappears.

The ribs are raised by four sets of muscles: one set, from the spine to the upper edge of each rib; a second set, from the ribs above, passing over two ribs to the third rib below; another set have their origin from the rib above, pass over one rib, and are inserted into the second below; and a fourth set pass from rib to rib.

The combined effect of these four sets of muscles, raises and extends the ribs: their direction and appearance is so distinctly seen in the annexed Figures, as to make a more particular description, in a Paper of this kind, unnecessary.

The skin of the back is brought forwards on the neck, by a large set of very long muscles, going off from each of the first twenty ribs on each side, a quarter of an inch from their head, by a tendinous origin, which soon becomes fleshy; the longest of these muscles is two inches long; they are inserted into the skin, and, when the ribs have been first extended, have the power of bringing the skin forwards to a great extent.

By these means, the hood is formed.

To depress the ribs, and restore the parts to that state in which the neck of the animal does not appear disproportionally protuberant, but of the same size as the rest of the snake, there are three sets of muscles: one set goes from the vertebræ of the neck to the lower edge of each rib; but, to give these muscles a greater length of fibre, they are not inserted into the rib immediately above the vertebræ, but pass upwards and outwards over three ribs, and are inserted into the fourth, at the middle part of it. These muscles become antagonists to those which raise the ribs.

The second set arises from the points of the ribs; and each muscle goes to be inserted into the skin, nearer the head, counteracting the muscles which bring the skin forwards, and drawing it, by their action, back again. The third set goes from the root of one scutum to the root of the scutum immediately above it, so as to bring it down upon the other.

The object of the present Paper being to explain the mechanism upon which the hood, the peculiar characteristic of this species of snake, depends, it is not meant to enter into the uses for which the hood is intended. It may not however be improper to observe, that the expansion of the ribs answers no good purpose respecting the lungs, since they are not so situated, in this animal, as to receive any advantage from it; but the gullet, where it passes down along the neck, admits of great expansion; and the extended state of the ribs, at the time the animal is employed in catching its prey, may give to the gullet a facility of being dilated, for the reception of the food.

## EXPLANATION OF THE FIGURES.

## Plate VII.

Fig. 1. A side view of the head and neck of the Cobra de Capello, drawn from the living animal.

Fig. 2. A back view of the hood.

Fig. 3. A front view of the hood.

## Plate VIII.

Fig. 4. A back view of the neck, in its expanded state; the external skin being dissected off, and turned aside, to show the muscles which raise the ribs, and bring the skin forwards towards the head.

This view is intended principally to exhibit the muscles which raise the ribs, and those which, when the ribs are raised, act upon the external skin, and bring it forwards.

AA. The scales on the head of the snake.

BB. The eyes.

CC. The muscles which surround the poison glands.

DD. A portion of the poison glands exposed.

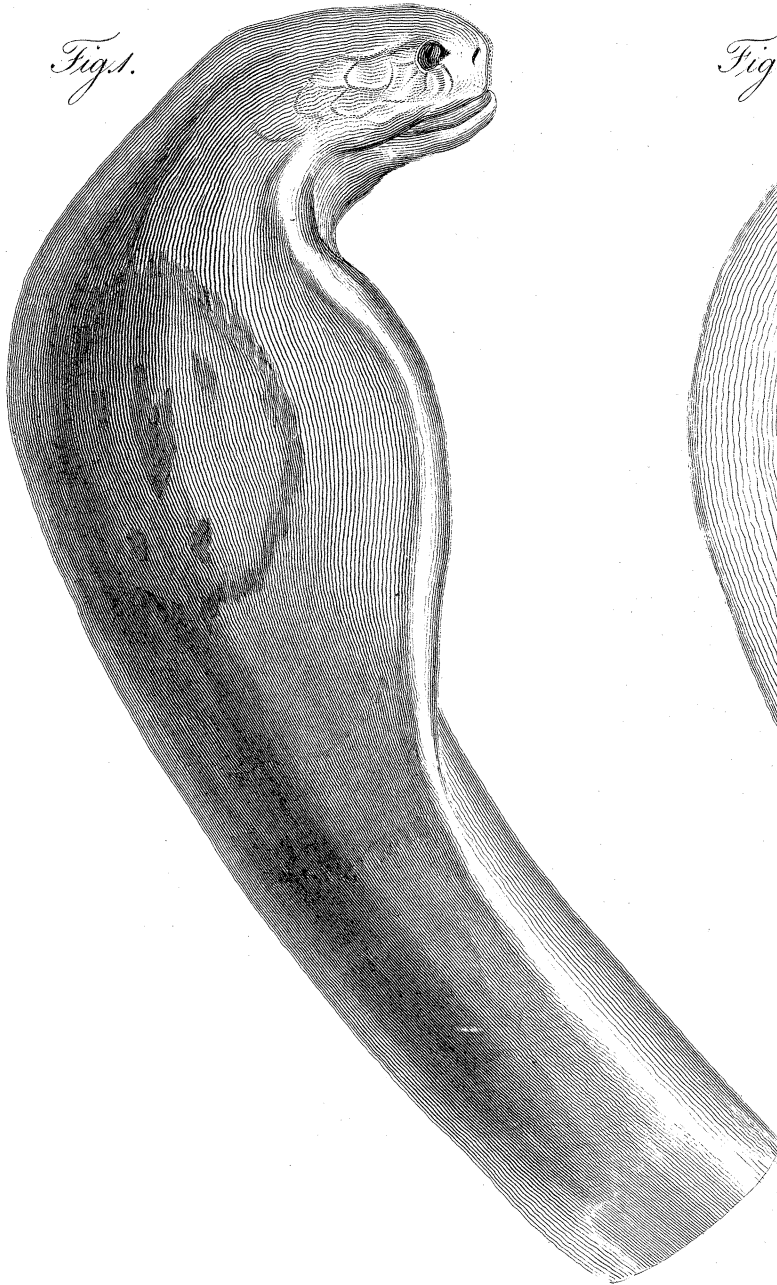
EE. A pair of muscles which rise from the neck, and terminate in the head.

F. One of a pair of muscles which bring the head back.

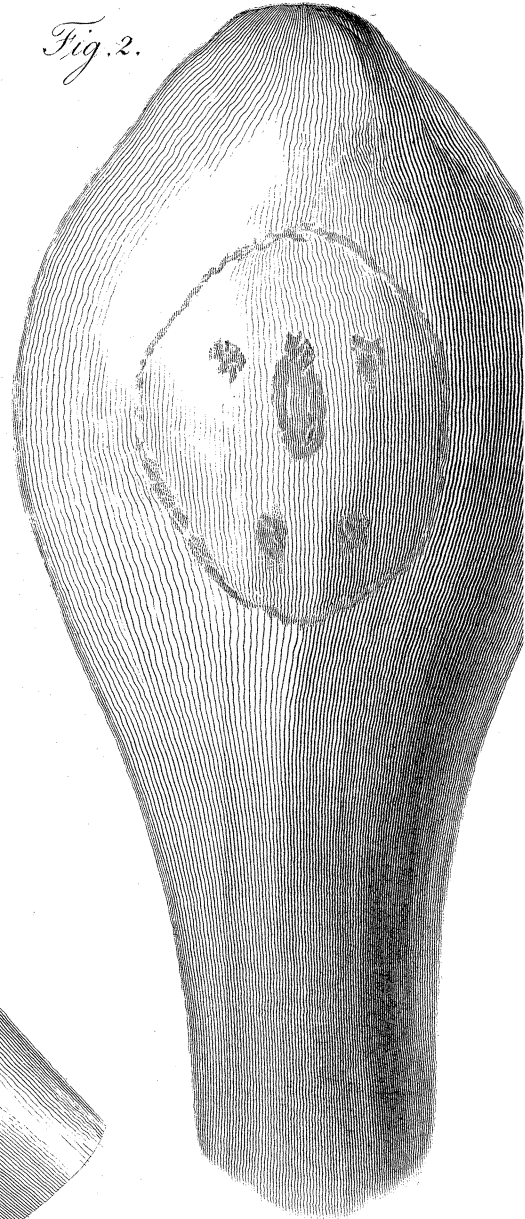
GG. The skin, divided in the middle line of the back, dissected from the muscles, and turned on each side.

HH. The intercostal muscles.

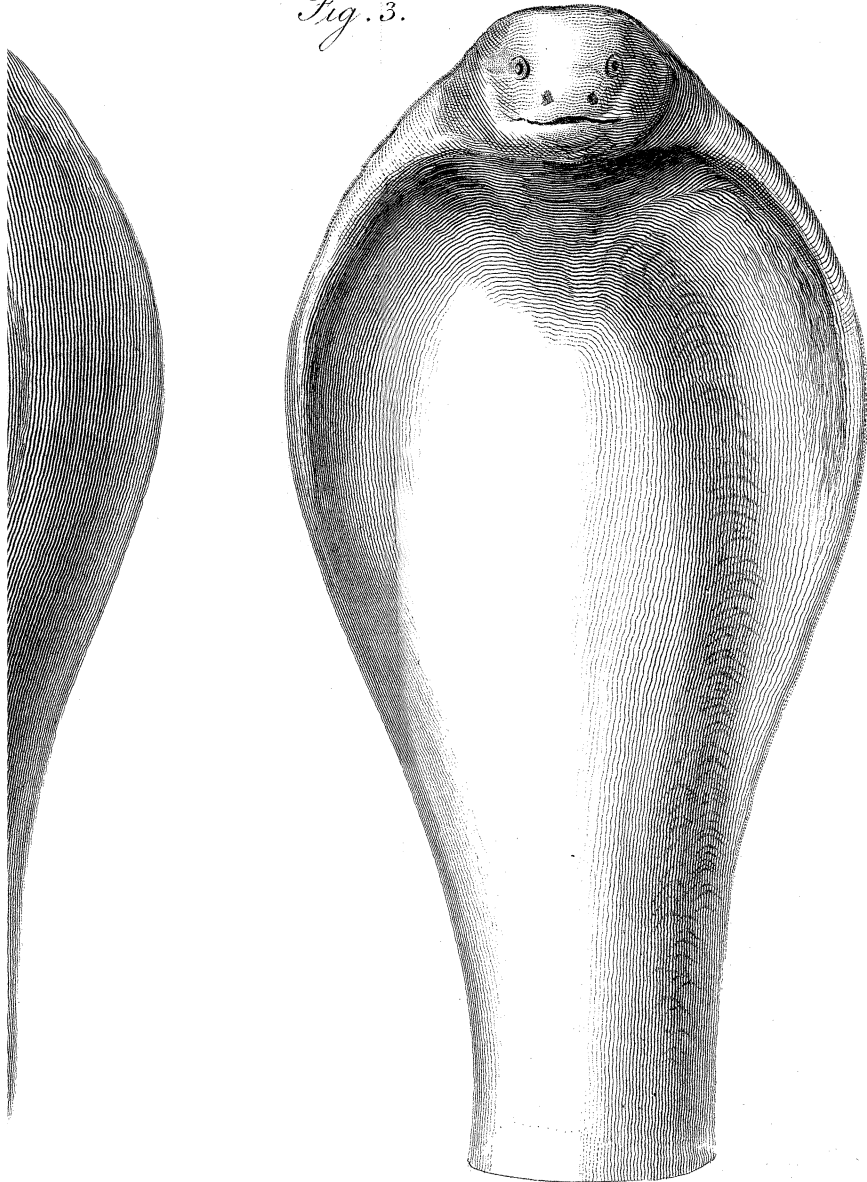
*Fig. 1.*



*Fig. 2.*



*Fig. 3.*



II. The muscles which bring forward the skin of the back upon the neck, to form the hood; they arise from the ribs, and are inserted into the skin.

KK. Muscles which raise the ribs; they originate from that part of the rib near the spine, pass over two ribs, and are inserted into the rib below, near its extremity.

LL. Muscles which raise the ribs, arising from one rib, and passing over the next, to be inserted into the rib below.

MM. The intercostal muscles.

Fig. 5. A front view of the neck; the parts are dissected, to show the mode in which the ribs lie in their depressed state, also the muscles by which they are depressed, and those which bring the skin back into its natural state.

AA. The two portions of the lower jaw, separated from each other, and turned aside.

BB. The poison fangs.

CCC. The ribs in their depressed state, lying over each other, on the side of the spine.

DDD. The ribs on the opposite side, in their extended state; their extremities become the boundary of the hood, and give it an oval form.

EE. A pair of muscles which bring the head forward upon the neck.

FF. The intercostal muscles.

GG. The muscles which bring the ribs downwards upon the spine.

HH. The muscles which bring the skin backwards from the neck; they have their origin from the points of the ribs, and are inserted into the lower edge of the abdominal scuta.

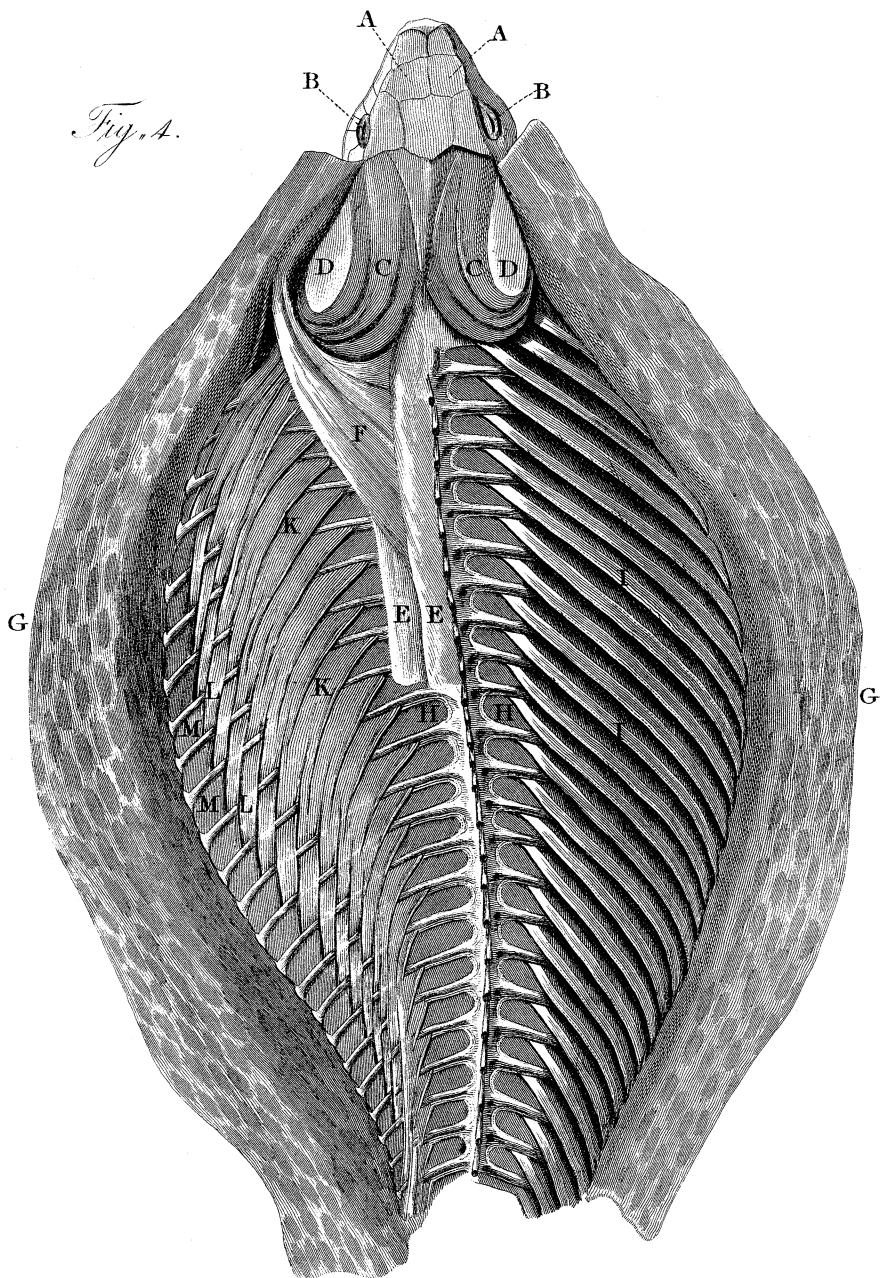


II. The abdominal scuta, divided in the middle line of the belly.

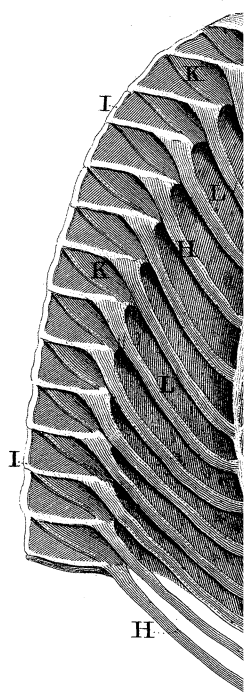
KK. The muscles which go from the lower edge of one scutum to the lower edge of the scutum over it, to bring the scuta closer together, and make them overlap.

LL. An internal view of the skin of the snake, beyond the abdominal scuta.

*Fig. 4.*



*Fig. 5.*



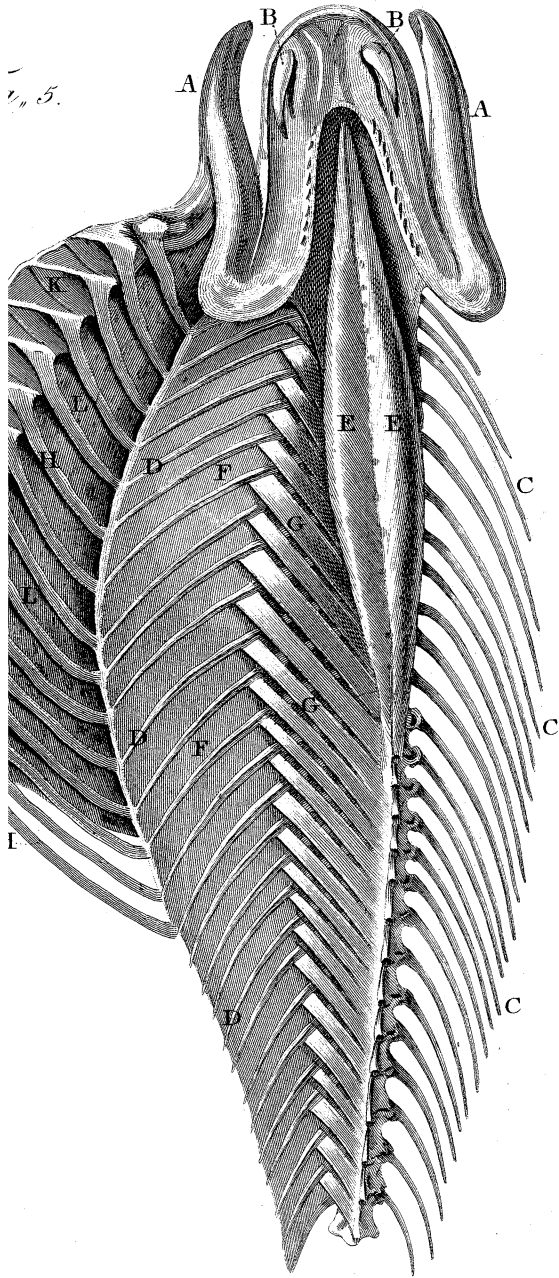




Fig. 4.

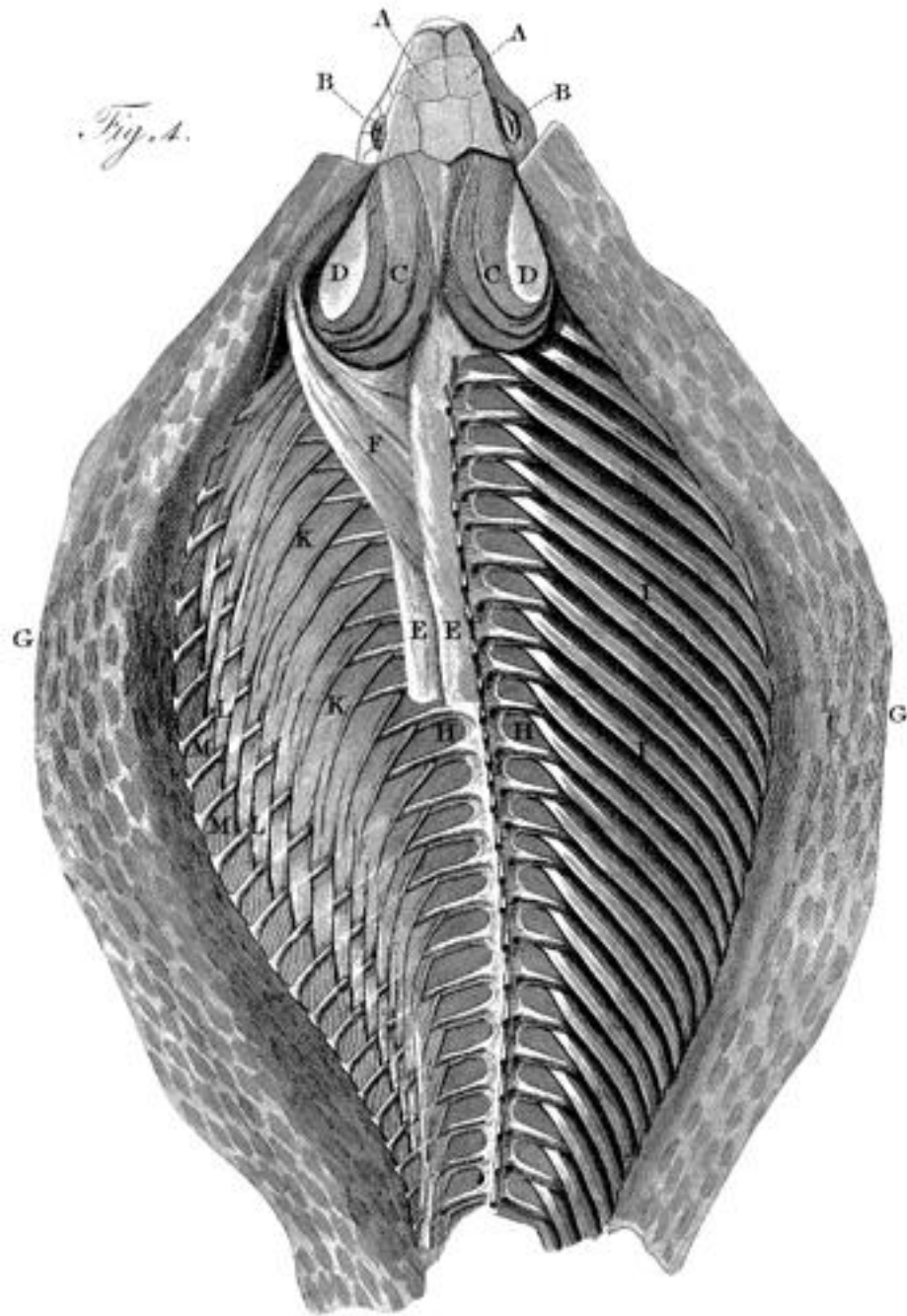


Fig. 5.

