**Upper Visceral system - details**

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Alfred S. Romer, the noted American zoologist has proposed a fundamental biological notion, namely that vertebrates actually have two bodies, that are apparently united but differ in many ways. (Romer, Alfred Sherwood, *The Vertebrate as a Dual Organism: The Somato-Visceral Animal*, Evolutionary Biology: Vol. 6, pp. 121-156, 1972).

There is the **visceral** body, which is concerned with essential life functions like feeding and respiration, fundamentally differs from the outer or **somatic,** one that merely enables movement. *Visceral* refers to the organs of the digestive track, however, in evolutionary terms it includes the entire feeding track, starting at the mouth. The part above the stomach, beginning with the diaphragm is consciously controllable, while the lower one is managed automatically. This section, available for our perception and muscular activation can be called the **Upper Visceral** body (**UV**). It works with all of our senses, breathing, food intake and processing, facial expressions, etc.

The UV consists of a group of organs and musculature that has evolved from the gills and some closely associated muscles of our fish ancestors, and which are more directly connected to the brain than the rest of the body.

**The evolution of the Upper Visceral body (UV)**

The difference between somatic and upper visceral bodies derives from our ancient fish ancestry. The earliest animals with backbone, the vertebrates are thought to be represented today by the Tunicates (Ascidicae), or sea squirts. These small primitive creatures typically live attached to rocks and corals draw in nutrients from the water, digest it and excrete the wastes. Aside from the fact that they reproduce, they are nothing more than a little food processing factory. What places them at an early point in our ancestral lineage is that they possess a notochord, the organ from which the backbone has evolved. However, this primitive backbone is only present in the larva of the sea squirt. The larva is also endowed with a tail composed of muscles and so it can swim. It is thus in basic ways just like a fish. When the time arrives, the larva adheres to some solid surface and turns into to the adult form, loses the notochord, and the swimming muscles; it deforms, it becomes sedentary. The larva is a digestive-reproductive organism with a tail attached to enable swimming. If the tail is lost and there is no need to move, then life can be reduced to the visceral and reproductive systems.

The feeding apparatus of the sea squirt consists mainly of a mouth opening, a **pharynx**, a stomach, a short intestine and an exit opening. The pharynx is by far the largest of these and it is a roughly pear shaped pouch with many small slits. Through these slits or gills the water is pushed out, filtering out the food particles which are sent to the stomach. This is the origin of the gills we see in fish, some salamanders, etc. But it took a long time before the larval sea squirt evolved into the fish; it had to abandon the sedentary phase of it life and retain the notochord and muscles of motility. Thus, the feeding organism, is thus older, more fundamental and more central to survival than the muscular one.

In our experience, providing us with the UV it is the body part which we closest identify ourselves. The sea squirt also has a simple nervous system controlling its pharyngeal gill apparatus, and this plus the muscles and nerves of the pharyngeal-digestive, are what in the earliest vertebrates has developed into the visceral system and its direct connection to the primitive brain stem.

This important, but largely neglected notion of **two distinct bodies** is crucial in understanding the **mind-body correlation**. While the nerves of the somatic body are connected only to the spinal cord, the upper visceral body (i.e., the organs of the upper respiration, feeding, hearing, smell, sound production, etc.) directly communicates with the brain through the twelve pairs of **cranial** nerves. Thus, since the somatic muscles of the eyes, as well as the hypobranchials, consisting of the facial, some superficial neck, shoulder, and some other muscles have evolved to become integrated with the branchial musculatures of the upper visceral system, their combined behavior is closely tied to mental states. This fact is undoubtedly reflected in the association of the latter with ocular, facial and other movements.

**Sessile of motile originally?**

Whether the tunicate was originally sessile and developed mobility at its larval stage to find a place for settling itself, or whether it was originally free swimming and at some point evolved the immobile adult stage cannot be answered. The answer is not only buried on the past, but today there are Tunicate species that have sessile forms, but are free-swimming, and there are those that live only a sedentary life.)

Would this difference between the possible original nature of our ancestors have any bearing on the importance of the UV in our present day lives? No, because the fact is that mobility is secondary to feeding and reproduction; corals, sponges and many other animals cannot move but they do eat, digest and reproduce and so live. In any case, few would argue that for the greatest degree we our life experience takes place in our upper visceral system. We do not feel emotions in our legs or arms. States of mind, emotions, thoughts are all sensed in a network comprised of the sensory organs, chiefly the eyes, the face, and the feeding and respiratory apparatus.

To express mental events we constantly refer to parts of the UV, the senses, respiration, and so one. Here are examples that occur in English: heartfelt, cordial, sweetheart, breaks one's heart, hearty welcome, can breath again, bitter sorrow, sour grapes, nauseating, turns one's stomach, a visceral or gut feeling, choke with emotion, tearful parting, and so on. Actually one does not feel love in the heart or some emotion in the lower viscerals, you feel mental states and specific muscular projection in those regions of the body.

**Cranial nerves**

The nerves entering at the base of the brain from all the regions of the UV are the twelve paired **cranial** nerves. The remaining nerves of the body connect to the spinal cord, not directly to the brain. Thus, there is a more direct association of the UV with the brain than is assigned to the somatic body. The

body muscles also affect the UV through their physical connections. The arms passing through the shoulders impact on the larynx; the omohyoid muscles ties together the scapula and the larynx, and this is the basis of **gesticulation**.

If the larynx needs to move a certain way, the arms, far more powerful assist it. That way the larynx need not spend much energy and therefore can tense minimally. This is important because increased laryngeal tensions constrict the glottis and then breathing or voice would be significantly obstructed. People always make it easier to speak by either moving arms and hands or else the head.

**List of UV parts**

**Hypobranchials** (derived from muscles under the gills.

When gills developed, the muscles beneath them were moved up and forward to spread over the face, head and shoulder, etc. Tongue, genioglossus, geniohyoid, hyoglossus, sternohyoid, thyrohyoid, sternothyroid, omohyoid, trapezius, sternocleidomastoid.

**Branchiomerics** (derived form gills)

These muscles are evolved forms of the bones and muscles of the gills. Muscles of mastication: temporalis, masseter, pterygoids. Other muscles: facial muscles, laryngeal muscles, mylohyoid, digastric anterior and posterior bellies, tensor palatini, levator palatini, intrinsic stylohyoid, stylopharyngeus, uvulae, palatoglossus, pharyngeal constrictors, palatopharyngeus, salpingopharyngeus. Aural: tensor timpani, stapedius. The branchiomeric **bones** and cartilages include the hyoid bone, those of the inner ear, the jaw, the larynx, etc.

**The cranial nerves**

Olfactory, optic, oculomotor, trochlear, trigeminal, abducens, facial, vestibulocochlear, glossopharyngeal, vagus, spinal accessory, and hypoglossal.

They communicate with the senses and movements involved in smell, vision, eye, pupils, muscles of mastication, senses in neck, sinuses, hearing (tympanic) membrane, muscles of expression, taste in the front two-thirds of the tongue, hearing and balance, various glands, sense and taste in posterior one-third of the tongue, sensation and muscles of pharynx, larynx, sensation of outer ears, muscles of trapezius, sternocleidomastoid, and tongue, except palatoglossal.

**The connections of the cranial nerves**

All cranial nerves, except the olfactory ones enter the brain stem, where the spinal cord merges with the brain. It has emerged far back in evolution and controls the basic functions of life-support.