

THE HUMAN SKELETON

CHAPTER OUTLINE AND STUDENT OBJECTIVES

- 1) Explain why the skeleton plays an important role in the overall shape of animal and human being.
- 2) Substantiate the differences in animal and human skeleton, with the human skeleton built in such a way, that man can go upright.
- 3) Explain the differences between the skeleton of apes and of humans.

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"We are in the habit of investigating life through a magnifying glass, of thus bringing otherwise invisible matter within our field of vision; how much larger our concept of life would be if it were possible to study it through a minimizing glass and thus bring to our field of vision matters that are beyond the reach of the eye, taking as a goal of our studies the cohesion of the phenomena rather than the analysis of matter, as we are doing now ?".

Louis Bolk, Professor of Anatomy and Anthropology at the University of Amsterdam, the Netherlands (18..-19..) in "Brain and Culture".

The skeleton gives *form* and *support* to the animal and the human being. All vertebrae share an internal skeleton. There seems to be an overall plan in the form and the development of the skeleton. This can be studied through embryology.

The main substance contained in the skeleton, which gives the skeleton its hardness, its sturdiness, is the element Calcium. The human being can develop and maintain an upright position because of the form and functionality of his skeleton. The posture of the human being is orientated to the vertical plane. The animal, however, can "only" develop and maintain a horizontal orientation (see Chapter XII).

Steiner: "Let us turn now to the comparison of the human skeleton with that of the so-called

higher apes, a gorilla, for example. If one compares these two skeletons on a purely superficial level, the main thing one will notice in the gorilla is the exceptional development of the entire lower jaw, simply in terms of mass. The lower jaw weighs heavily on the skull. When one looks at the head of the gorilla with its massive lower jaw, one can get the feeling that the lower jaw weighs heavily on the entire skeleton in some way, pushing it forward, and the gorilla makes a considerable effort to remain upright in spite of this burden.

One will find the same distribution of weight, in contrast to the human skeleton, when one looks at the gorilla's forearms and the lower part of the hands. They seem heavy. In the gorilla everything is massive. In contrast, everything is refined and delicately jointed in the human being; here weight is backgrounded.

In these particular parts of the body, the lower jaw and the forearms and fingers, the element of weight moves into the background in the human being, while it is prominent in the gorilla. Anyone who has cultivated a sharp eye for these proportions will be able to find them again in the bones of the feet and the legs. There, too, an element of weight is present in the gorilla, pushing in a certain direction.

The arrows in the above figure indicate the *force* that can be seen in the gorilla's lower jaw, arms and legs. In the human being, this force is counteracted by an upward-striving element. This conclusion is inevitable if one observes a human lower jaw, which no longer weighs down the skeleton, and the delicate shaping of human arms and fingers.

The difference between a gorilla skeleton and a human skeleton is evident to the naked eye. One will have to deduce the form-creating element in the human being from a kind of parallelogram of forces, which results from the same upward force to which gorillas adapt only outwardly, as one can tell by the effort required for them to maintain uprightness. Here is the resulting parallelogram with its lines of force:

The very strange thing about this is that nowadays one restricts oneself to simply comparing the bones or muscles of higher animals to those of humans and one fails to place enough emphasis on this morphological transformation. In observing it, one must look for one essential aspect. In the human being, the forces that counteract those determining a gorilla's form must actually be present.

Those forces must exist; they must be at work. If one looks for them, one will discover the aspect of ancient medicine that was abandoned or filtered out by the Hippocratic system. One will discover that the original forces in the parallelogram are earthly in character, (forces of *gravity*). The other forces, however, must be sought *outside* the earth. They unite with the original forces, and what results owes its origin to supra-earthly, extra-terrestrial forces (forces of *levity*), rather than to earthly ones.

One must look for forces that pull human beings into the upright position. This is not the same as the upright position that higher animals assume from time to time, because the forces active in bringing about human uprightness are also *formative* forces. It makes a difference whether one is dealing with apes, who walk upright but still possess forces that weigh them down in the other direction, or with humans, whose skeletal development works in the direction of forces that are non-earthly in origin.

If one simply looks at the form of the human skeleton in the right way, tracing the dynamics at work in building it up, instead of restricting oneself to describing the individual bones and comparing them to animal bones, one will realize that what one sees there is not to be found anywhere in the other kingdoms of nature. One must unite the specifically human forces with the original forces in the parallelogram. The result cannot be accounted for by considering only forces that exist outside the human being. It will be important for us to make a careful study of this leap from the animal to the human.

When one does so, one will be able to discover the origin of disease in both humans and animals. One can discover these elements only little by little, as one gets trained in recognizing them, but if one were to pursue it further, one would be able to make many discoveries.

In this connection, one should be aware of the following. If one shifts one's attention from the skeletal system to the muscular system, one can discover significant differences in the character of muscles. A muscle at rest is alkaline in reaction, if one takes its typical chemical effect into account. But one could actually say that its reaction is alkaline-like, because in a resting muscle the reaction is not as clear-cut as alkaline reactions otherwise are. Similarly, in an active muscle a somewhat indefinite acid reaction occurs.

As one may recall, in a metabolic sense muscles are composed, of course, of what human

beings ingest. Therefore, in a certain respect they are a result of the forces present in earthly substances. But when human beings become active, it becomes increasingly evident that what their muscle tissue contains as a result of being subject only to ordinary metabolism, is being overcome. The changes appearing in active muscle tissue stand in contrast to ordinary metabolic changes and can ultimately be compared only to the forces bringing about the formation of the human skeletal system. These latter forces, which transcend what humans acquire >from outside, imbue themselves with terrestrial forces, uniting with them to bring about a resultant force. Similarly, we must also see muscle metabolism as containing something chemically active that is working into the earth's chemistry. One might say that in the skeleton something one can no longer find within the earthly element is working into earthly mechanics and dynamics. Similarly, in our metabolism we have non-earthly chemistry working into earthly chemistry to produce effects different from those that can appear under the influence of earthly chemistry alone.

These observations about morphology on the one hand and the qualities on the other will have to constitute one's point of departure if one wants to discover what actually lies within the human being. This approach will reopen the way back to something that has been lost, but which is obviously still needed if one is not willing to accept a merely formal definition of disease which is useless in actual practice. A very important question emerges. Earthly remedies from one's surroundings are all that one has available with which to work on the human organism when it undergoes changes. Non-earthly forces, however, are at work in oneself or, at least, forces that turn one's processes into non-earthly processes. This gives rise to the question of how one can bring about an interaction between the sick human organism and its physical earthly environment, an interaction that leads from illness to health. How can one call forth a reciprocal relationship of this sort that will really also be able to influence those forces active in the human organism that are not encompassed by the realm of processes from which one selects one's medicines, even if these processes are dietary prescriptions and so forth? (Chapter I, "Introducing Anthroposophical Medicine" by Rudolf Steiner, Anthroposophical Press, ISBN 0-88010-463-5).

When one observes the three regions of the skeleton, one can distinguish three distinct anatomical structures: the *skull*, the *limbs* (arms including shoulder girdle, and the legs including the pelvic girdle), and what connects them – the *spinal column* and *thorax*.

When one observes the skull, one could say that the skull is round like a marble and

remarkably small and concentrated. The skull is composed of the bones of the face with the lower jaw and the cranium. The latter looks like a dome; the former is characterized by the many openings connected with one's sense organs. On the sides are the acoustic holes.

The thorax is notable for the rhythmic repetition of the shape of the ribs. The dozen pairs of ribs enclose the thorax and are attached to the sternum by cartilage, except for the two lowest, the so-called "floating" ribs. They are attached to the spine by joints at the back.

The shoulder girdle consists of shoulder blades and collar bones. The shoulder blades are actually fusions of originally separate bones. The comb on the shoulder blade is remarkable as it stands out significantly.

The pelvis consists of two hipbones and the sacrum. The latter is a fusion of the five sacral vertebrae. The arms form joints with the shoulder blades. In the same way the legs join with the hipbones on the spot where three formerly separate bones have been fused into the hipbone.

The spine runs dorsally through the whole trunk. It is a very important part of our skeleton and is composed of various types of vertebrae. The vertebrae have a typical structure: a solid, large oval center; the body, to which is attached dorsally the vertebral arch, with the dorsal processes and transverse processes extending laterally from the arch. Arch and body enclose the vertebral canal.

Like most mammals, humans have seven cervical vertebrae of a fine structure, with pierced transverse processes, through which the vertebral arteries run towards the skull; twelve thoracic vertebrae that support the ribs; five lumbar vertebrae, heavier and coarser than the others, and five sacral vertebrae that are fused into one sacrum. Several caudal vertebrae are fused to form the coccyx.

The spinal column is a splendid example of metamorphosis in the human body. If we look at the whole, we can describe it as the spinal column with thorax, at the one end supporting the head and at the other end standing on the earth by means of the pelvis and the legs. Shoulder blades and arms are connected to the thorax only by means of the front of the collar bones – thus *hardly at all!*

The bones of head and limbs are absolute polarities. The skull is round, enclosing and concentrated, consisting of flat or irregular bones that are joined by seams (except, of course,

the lower jaw). The skull encloses all the important organs *inside* the skull. Roundness is the true "cosmic" form. A newborn child has predominantly roundness expressed in its anatomy. The head is proportionally large, and no true neck or waist has developed yet. Everything is still round and during the first three septennials, the child will mature into adulthood, and its body will stretch, become elongated. The head will get "smaller" in comparison to the rest of the body, and the limbs will grow to their final length. By contrast, the limbs are linear; they consist of the so-called long bones. The various parts are connected by extremely mobile joints. The main organs of the limbs, namely the muscles, are, in contrast to the skull, around or *outside* the bony structures.

Since the human being is the only truly upright creature on earth, the arms occupy a special position because they are also in the service of the mental and spiritual life: for example, in gesticulation. Hands folded in prayer vaguely imitate the shape of the skull. Between the poles of the head and hands, is the thorax, which in its construction has a formal similarity to each. It is enclosing, but less so than the skull, and with much more mobility. In the upper part of the thorax, the first four sets of ribs, which are the closest to the skull, are still able to make more or less concentric circles, they close off, as the skull does, with the help of the sternum and manubrium.

In the middle part of the thorax, the next six pairs of ribs open up somewhat and they are no longer able to reach the sternum by themselves: they hold on to the previous pair of ribs by means of cartilage. This cartilaginous mediation guarantees a certain mobility.

And in the lower part of the thorax, the last two pairs of ribs, the floating ribs, which are essentially located below the diaphragm, stand out as little limbs: they radiate outwards, like limbs do, and they are most mobile.

In Chapter VII we discussed the fact that the nerve-sense system in the head (skull) represents the pole of immobility and that the metabolic-limb system represents the pole of mobility. The rhythmic system comes about as something new; a new principle is being born all the time. This rhythmic principle is also expressed in the skeleton. Between the skull and the limbs, we find the thorax, with its ribs, rhythmically forming the thoracic wall, and the spinal column, with all its sequential vertebrae as a clear expression of rhythm.

Now, by observing the skeleton one can better understand that the limbs belong to the

metabolic system, in its polarity to the skull with its nerve-sense system.

The frontal skull can also be divided into three areas: forehead, nasal area, plus the mouth and jaws. The first is a dome; the second shows within it the rhythmic repetition of the nose shells (conchae). Of the jaws only the lower part is mobile, yet both jaws represent the "limbs" of the head, as we will further discover later in this chapter.

With a little imagination the same principle can be seen in the arms and legs, each with their three-fold structure of upper arm/ upper leg, lower arm/ lower leg, and hand/ foot. Here one thinks especially of the remarkable ball (caput) and socket (acetabulum) joints of the shoulder and the hip. The lower arms (axis and radius) and legs (tibia and fibula) each have two bones; the hands and feet have "many" bones, and are the most mobile portion of the limbs.

It is not difficult to find the same 3-fold idea within the hand itself, which is divided into the carpus, the metacarpus, and the fingers. The same holds true for the foot.

There exist similar correlations between the leg and the jaw (mandibula), the arm and the upper jaw (maxilla), and the collar bone (clavicula) and the cheekbone (zygomaticus). And, once again, there exists a correlation between the teeth of the maxilla and the fingers, as well as between the teeth of the mandibula and the toes.

The first set of ten teeth (milk teeth) of the maxilla corresponds with the ten fingers. When the milk teeth are expelled and the permanent set of sixteen teeth replaces the milk teeth, the latter correspond to the sixteen carpal bones of the wrists. The same holds true for the teeth of the mandibula and the toes and tarsal bones of the feet.

For further study, the book: "Secrets of the Skeleton" by Leen Mees, (Anthroposophical Press, ISBN 0-88010-087-7) is highly recommended.

An interesting confirmation of these correlations can be found in one of the practices of acupunctural anaesthesia. Preceding a dental procedure, in order to apply anaesthesia to the teeth of the upper jaw, one stimulates, by means of electro-acupuncture, certain acupuncture spots between the metacarpal bones in the hand. On the other hand, in order to apply anaesthesia to the teeth of the lower jaw, one uses acupuncture spots between the metacarpal bones in the feet.

CONCLUSION

In this chapter, the principles of threefoldness and *metamorphosis* in the skeleton are discussed. The skeleton is another organ, which demonstrates to the beginning student of Anthroposophical Medicine the principles of threefoldness, the polarity sclerosis-inflammation, and metamorphosis: three-foldness and metamorphosis can be found everywhere, and this chapter tries to demonstrate that, taking the human skeleton as another example.

After completion of this chapter, the student should be able to give ample examples of various forms of metamorphosis and three-fold principles in the skeleton, both in the human as well as in animal skeleton.