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PROBLEMS OF ESTIMATING AGE AND DETERMINING THE PROFESSIONS WHEN ANALYZING PREHISTORIC SKELETONS

ABSTRACT: The problems of estimating age and the possibility of determining the profession when studying skeletons of unknown individuals from ancient cemeteries are presented on the skeleton of the well-known astronomer J. Hevelius from XVII c. Gdańsk. Distinguishing the features determining age, their connection with fitness is underlined.

KEY WORDS: Estimation of age — Profession — Prehistoric skeletons.

Many methods are known of estimating such features as age, sex, pathological changes and those resulting from the profession of individuals found in ancient cemeteries.

It is interesting that many of the observed traits on bones help to estimate the living conditions of the individual in question.

We know from our experience on osteological material that the estimation of age is often difficult. We are able to recognize whether the studied skeleton belongs to a child, youth, adult or senile. But the limits between these categories of age are very variable, which makes it very difficult to decide whether one individual was 18 or 20, 45 or 60 years old. The main features such as: sutures, spongy tissue or traces of growth cartilage, changes of features during the developmental process, depend on many conditions. How far the fitness depends on the developmental process of a living organism can be clearly observed on osteological material which is well known, i.e. when we know in what social and economic conditions the examined individual lived, i.e. when the history of his life is well known.

Such observations are possible when analyzing the skeletons of famous or well known people like kings, dukes, scientists or saints – whose life history is known in detail.

Observations presented here were made on the skeleton of the famous astronomer from Gdańsk Johan Hevelius, who lived in the XVIIth century (*Figure 1*).

The grave of J. Hevelius is in St. Catharine's Church in Gdańsk under the epitaph of the astronomer. It is a family grave with seven coffins. The obituary: "J. H. Anno 1687, 27. Januar", on the best preserved coffin proves that Johan Hevelius, who died on 28 January 1687, was buried in this coffin.

He lived 76 years (1611 – 1687). Both his parents and himself were socially very well situated.

The state of preservation of the skeleton is rather good (*Figure 2*). Only the skull, some vertebrae, the sacral bone, right arm bone, hip and foot bones were damaged.

The features determining age observed on J. Hevelius's skeleton are intriguing. As mentioned above J. Hevelius was 76

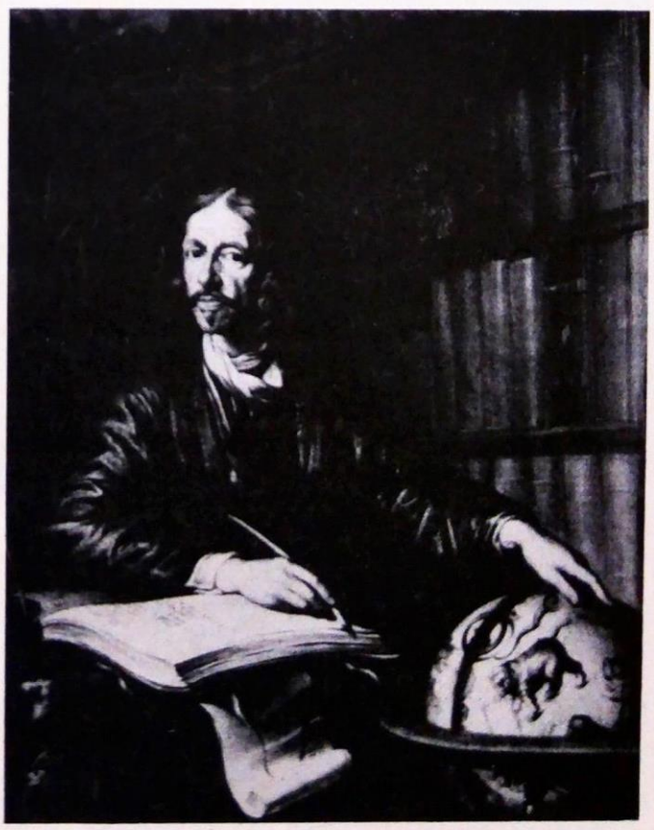

FIGURE 1. *Johanus Hevelius, painted by D. Schulz (photo by K. Nowalinski).*

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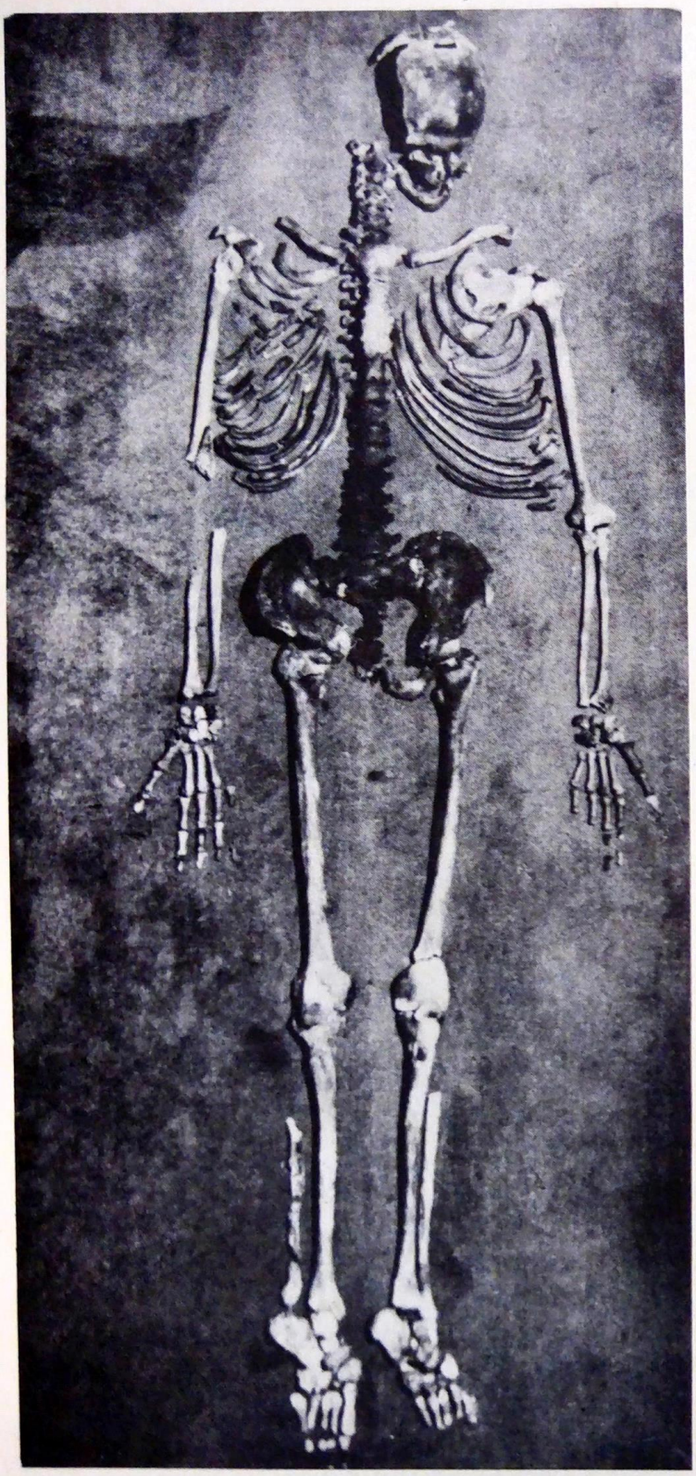


FIGURE 2. *A general view of the reconstructed skeleton of preserved bones (photo by A. Klein).*

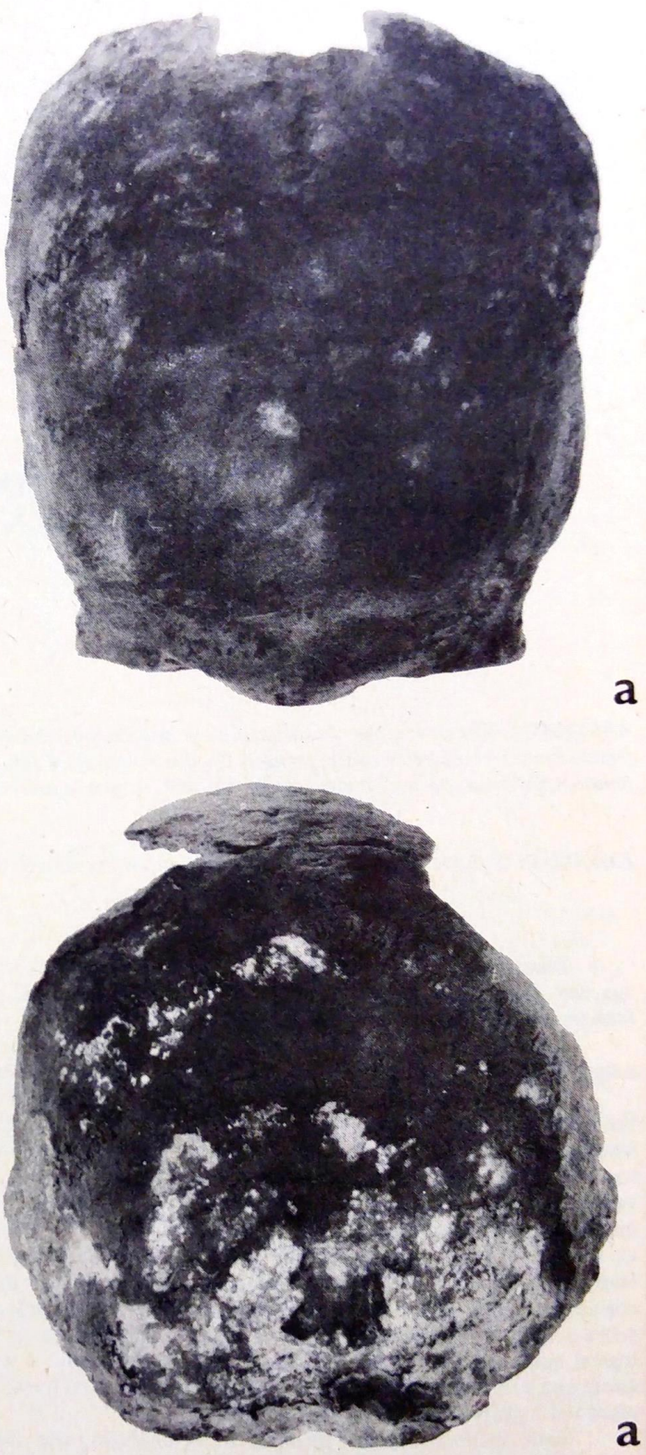


FIGURE 3. *Sutures of the vault, a) on the external surface (photo by D. Jezyk).*

years old, yet some features determining age are characteristic rather for a 40 – 50 year-old man. As we see in *Figure 3*, preserved sutures on the external surface of the vault are clearly visible (*Figure 3a*), they are completely ossified only on the inner surface (*Figure 3b*). This is in contradiction with the maxilla and mandible which are typical for advanced age (*Figure 4a, b*).

In the vertebral column the most serious degenerative changes are located in the cervical and upper parts of the thoracic vertebral column. They are linked with the profession. In the remaining parts of the column only discreet exostoses, mainly on the margins of the vertebral bodies, slightly deepened thoracic kyphosis and moderate osteoporosis are visible (*Figure 5*). Other interesting patterns are observed in the sternal bone. As we see in *Figure 6* the manubrium is not united with the corpus (*Figure 6b*). Also the first ribs are atypical because of existing traces of cartilage (*Figure 7*). Harris lines and traces of the ossified cartilage are also visible in the tibia and sacral bones (*Figure 8*). The degenerative changes caused by age are situated also in sacroiliac articulations. Some ligaments and muscle insertions are partially ossified (*Figure 8b*). Some pathological changes, like cystic attenuation, are seen on the carpal bones and on the epiphyses of the femoral (*Figure 10b*) and other leg bones. As the X-ray picture shows, the state of bone calcification is very good, which is very rare in a man over sixty.

As we see the characters determining age are very variable. Some of them are characteristic for a senile man (maxilla and mandible, osteoporosis of some bones), others are typical rather for a 40 – 50-year-old man.

FIGURE 3. *Sutures of the vault b) on the inner surface (photo by D. Jezyk).*

FIGURE 4. *a) Completely obliterated maxilla and b) mandible with first premolar tooth (photo by D. Jezyk).*

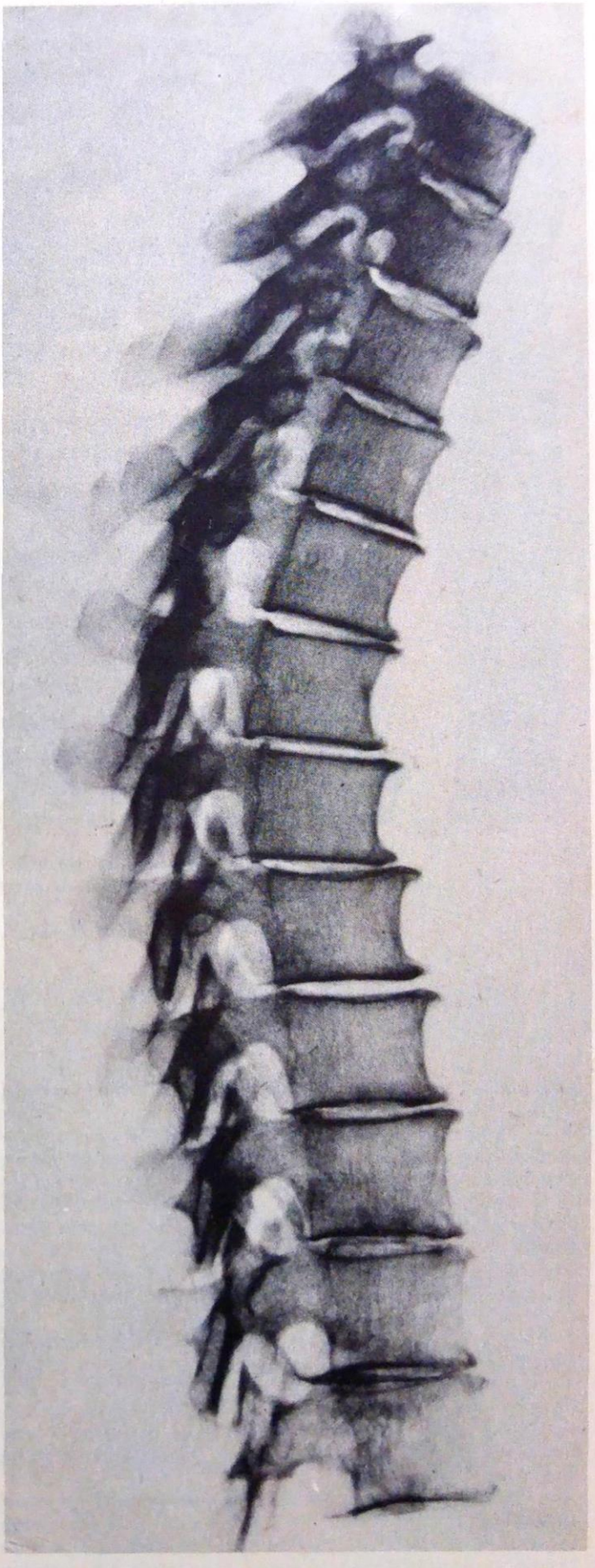


FIGURE 5. *Thoracic vertebrae, discreetly deepened kyphosis.*

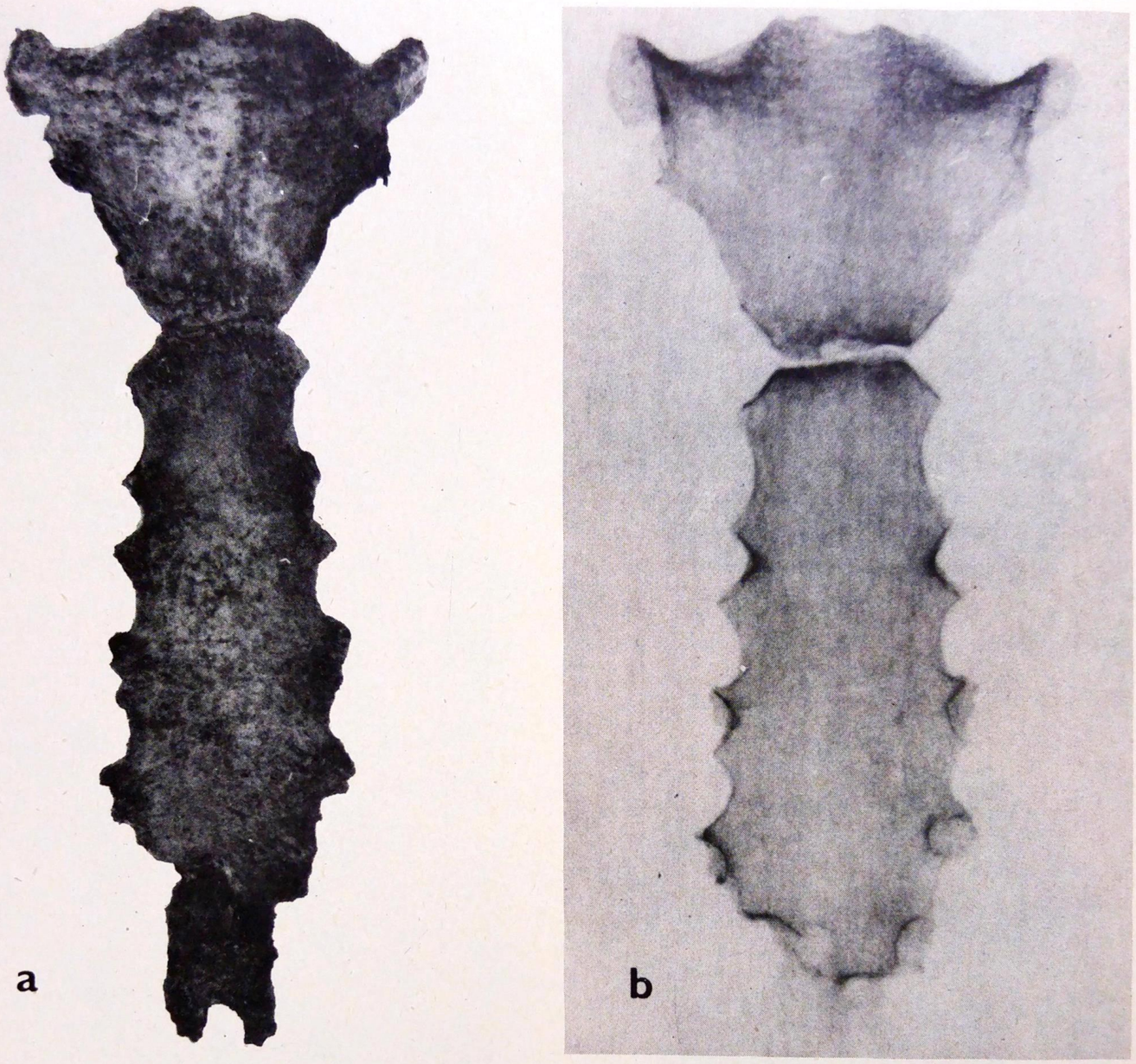


FIGURE 6. *a) Sternum. Manubrium does not adhere to the corpus, b) X-ray (photo by A. Klein).*

These facts prove that when analyzing the skeleton of an unknown individual from an ancient cemetery the above curious situation should be kept in mind. This also means that if we have an incomplete skeleton, e.g. only maxilla and mandible with obliterated tooth sockets with worn-out individual teeth we can suppose that the individual was senile when he died. But if we have only bones with well visible sutures and with discreet or moderate degenerative changes we are not able to exclude senile age.

Another problem is which age determining characters are strongly or weakly connected with fitness; e.g. which of them, during their developmental process, are inhibited by good living conditions. The observation of J. Hevelius's skeleton suggests that only the process of senescence of the teeth is not inhibited by fitness. But this is only a supposition based on this single case.

Very interesting are the changes observed in J. Hevelius's skeleton which are connected with his profession. These changes are located in the vertebral column, in its cervical and upper thoracic parts as well as in the bones of the superior extremities.

In the superior part of the vertebral column exostoses from 1 to 5 mm in size are visible. They surround the flattened and porous articular facets (*Figure 11*). In the upper thoracic part the articular facets are also polished. The most developed pathological changes, in the cervical part, are present on the left side of

FIGURE 7. *First ribs, traces of ossified cartilage (photo by A. Klein).*

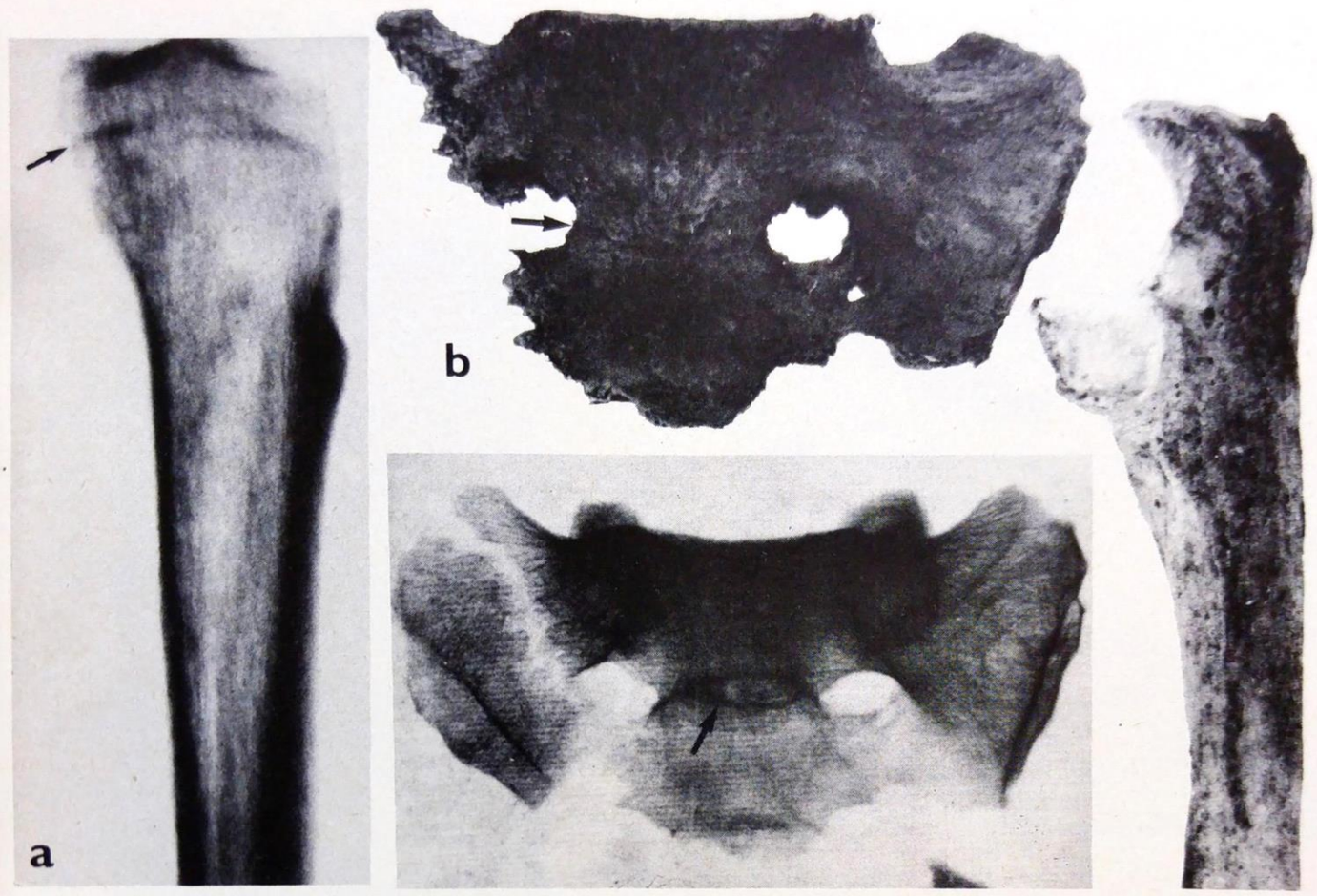


FIGURE 8. *a) X-ray of the tibia bone shows the looseness of the spongy structure and traces of the ossified cartilage. b) Sacral bone with transversal line distinctly visible (photo by A. Klein).*

FIGURE 9. *Ulnar bone with partially ossified muscle insertion (photo by A. Klein).*

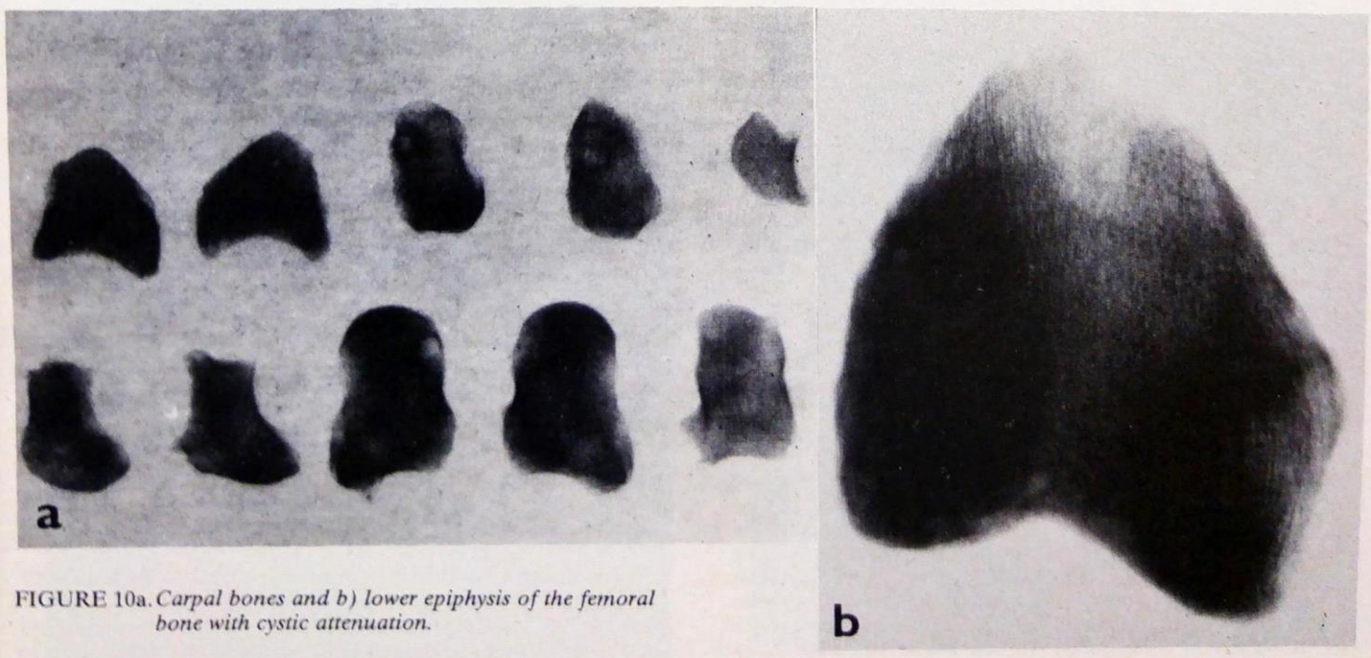


FIGURE 10a. *Carpal bones and b) lower epiphysis of the femoral bone with cystic attenuation.*

the third, fourth, sixth and seventh vertebrae. On the inferior surface of the corpus of the sixth and the superior surface of the seventh vertebrae and their margins there are serious lesions proving discopathy (*Figure 12*). In the upper thoracic part of the column the most distinct pathological changes are on the third, fourth and fifth vertebrae, mainly on their right side.

On the collar bones the tuberosities for the muscle attachment are well developed. It is worth noticing that the

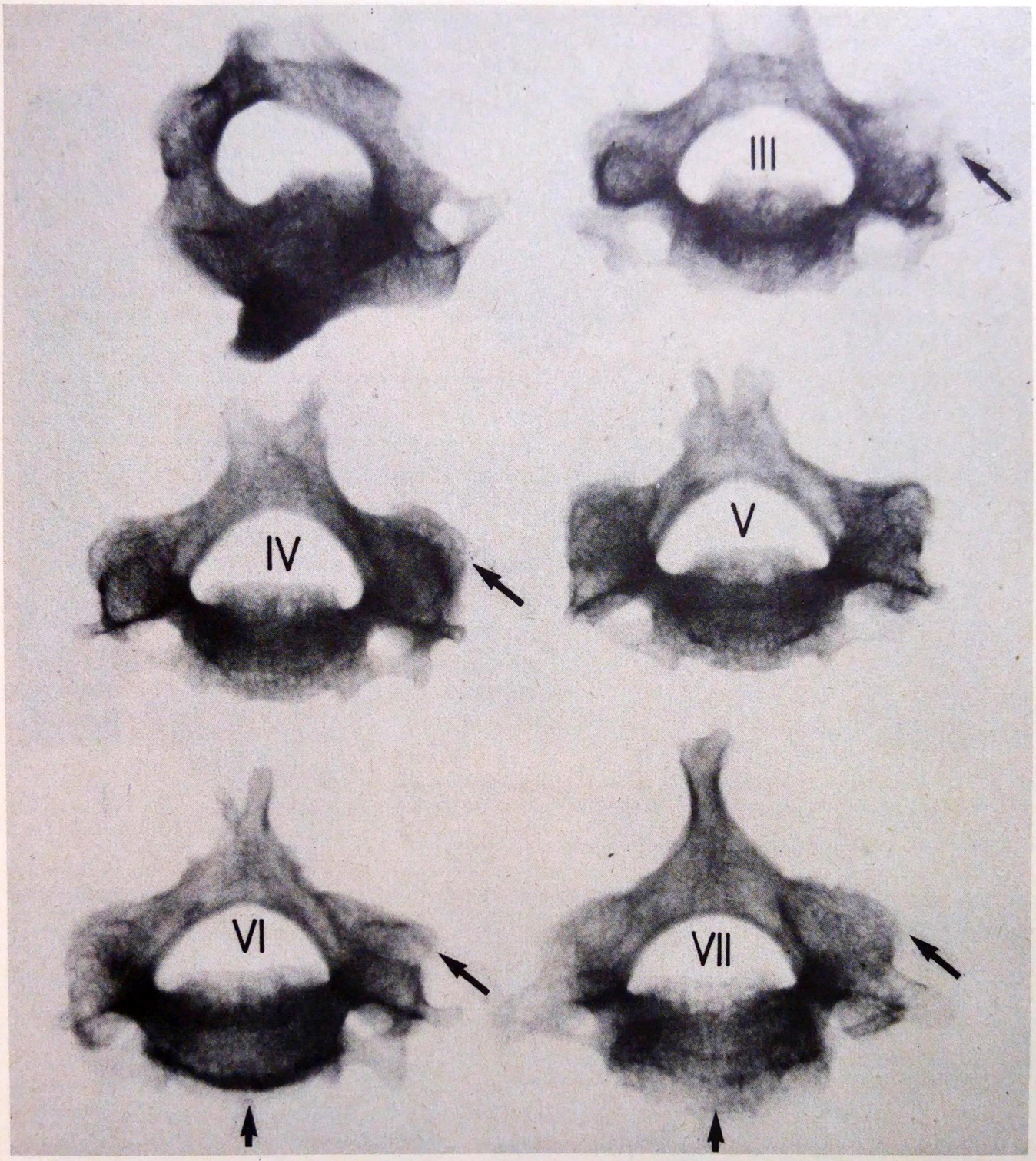


FIGURE 11. *Cervical vertebrae with exostoses, flattened and porous articular facets.*

articular facets of the sternal extremities are partially displaced on the anterior surface of the bone. These facets are also changed by the degenerative process. Besides well developed surfaces for the attachment of muscles and rather discreet exostoses surrounding the articular facets of scapula, humerus and ulna bones the most apparent degenerative changes are present on the carpal articular surfaces of both radii (*Figure 13*). Their arthritic changes prove that the hands in these joints worked for a long time in an abductive position.

In all bones of the hands degenerative – deformative changes are present: mainly on the scaphoid, trapezium and trapezoid bones. Their articular facets are not only deformed but also polished and surrounded by strong exostoses (*Figures 14, 15*). Of the metacarpal bones the first one is the most changed. It is strongly deformed with polished articular surface. The phalanges, chiefly the phalanges of the thumb, the second and fifth finger and of the third row are also deformed (*Figure 14*).

All these serious degenerative – deformative changes localized in the upper part of the vertebral column and in the bones of the upper extremities, mainly in the sternoclavicular and hand articulations are the result of long lasting conditions. The changes visible on the cervical and upper thoracic parts of the vertebral column are connected with a specific position of the head: in posterior flexion with some abduction to the right. Another result of such a position is the discopathy between the fifth and sixth cervical vertebrae. The deformations, mainly visible

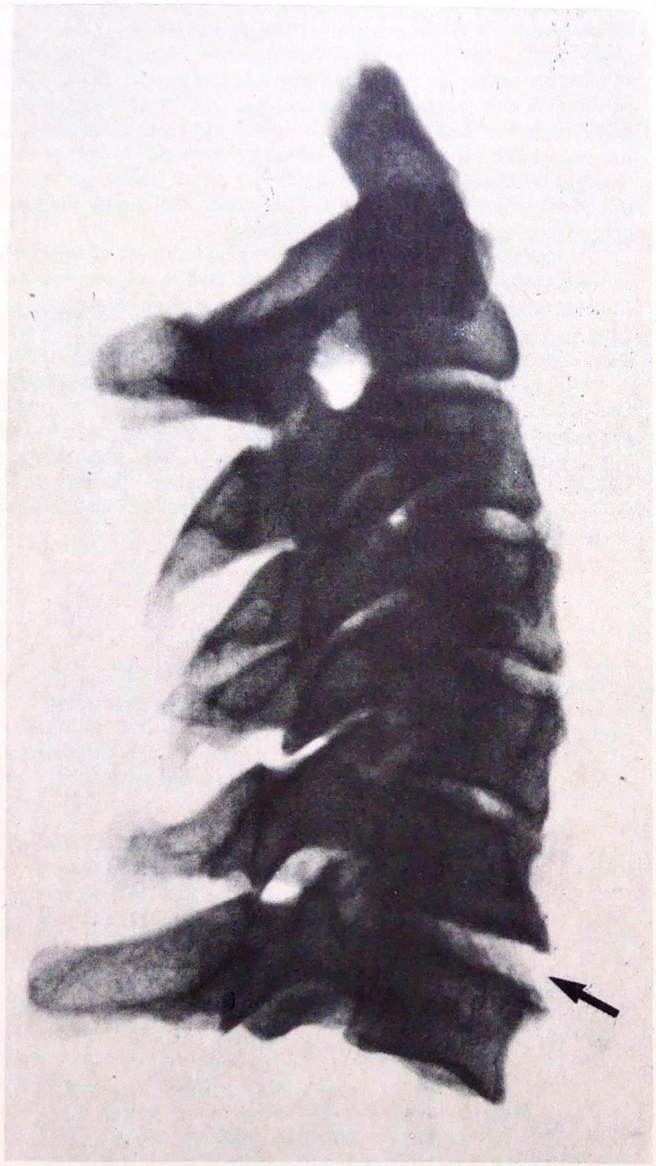


FIGURE 12. *Cervical part of vertebral column. Traces of discopathy between 6th and 7th vertebrae.*

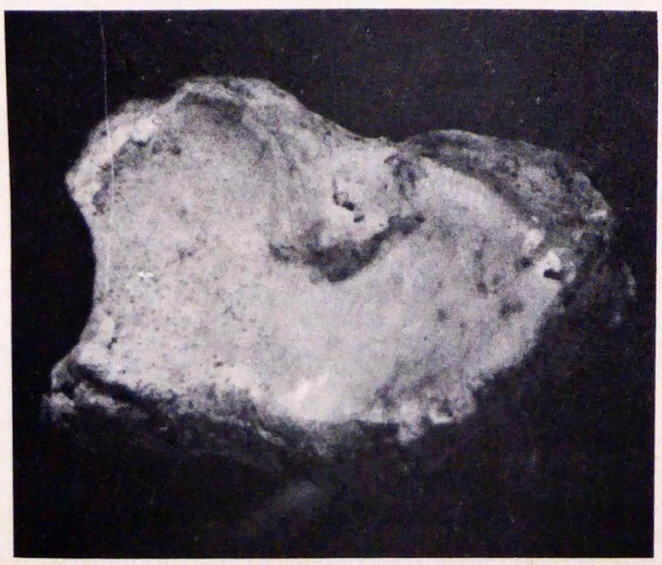
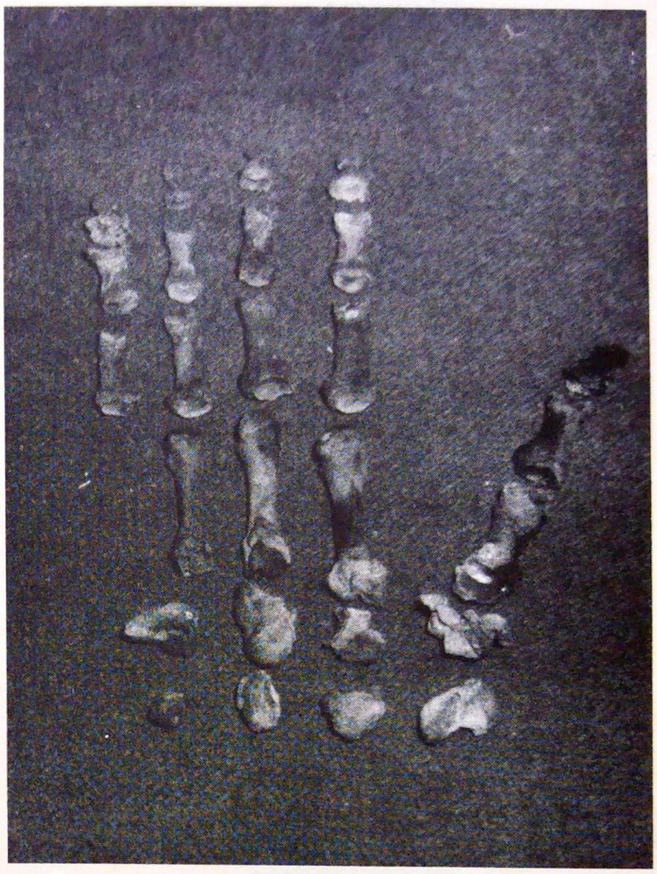
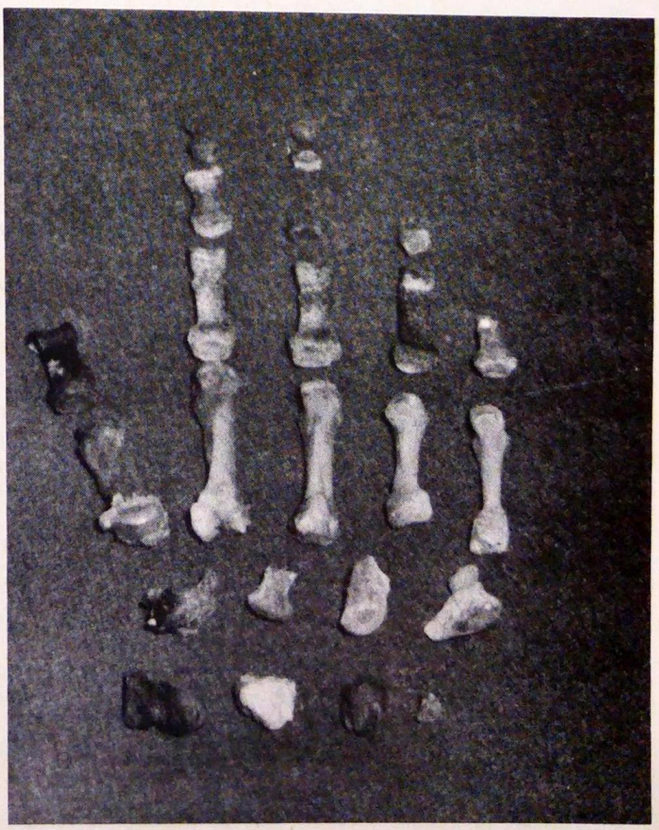


FIGURE 13. *Carpal articular surface of radius deformed by roller-shaped swelling, is partially polished and porous (photo by A. Klein).*



a



b

FIGURE 14. *a, b) Bones of the hands. All with degenerative changes (photo by A. Klein).*

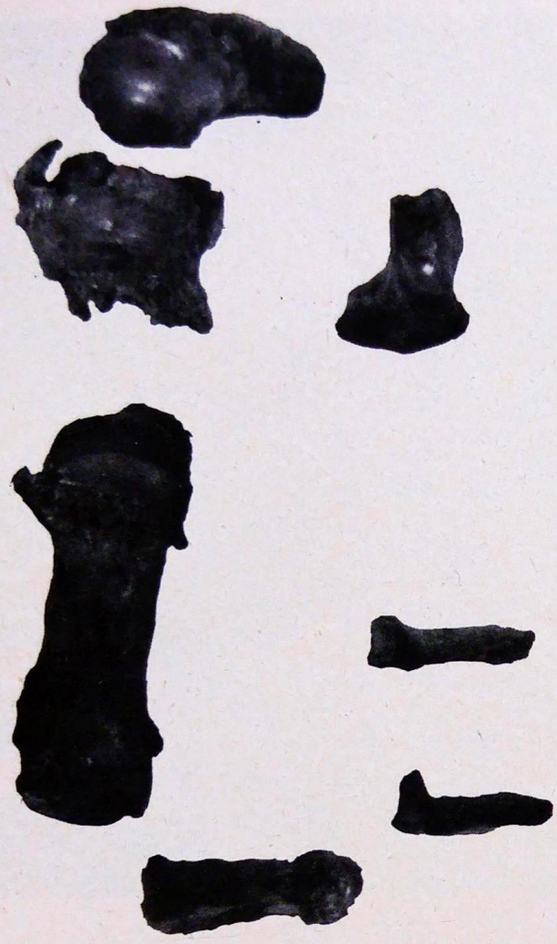


FIGURE 15. *Bones of the hands: scaphoid, trapezium, trapezoid and the 1st metatarsal bones (photo by A. Klein).*

on the sternal extremity of both clavicles and on the hands, are complementary to the position of the upper extremities, which is characteristic for professional viewing with telescope. The result of such a position of the collar bones is the partial displacement of the articular facets of the sternal extremities on their anterior surfaces and of their degenerative changes, whereas on the hand bones, mainly on the thumbs, strongly developed degenerative changes occur. Deformations visible on other phalanges are undoubtedly the result of the low temperature in which the astronomer had carried out his observations.

The morphological and radiological analyses of Johan Hevelius's skeleton confirmed his living conditions and his daily routine as known from history. These prove that he grew up and lived in very good circumstances and that many years of his life were devoted to frequent astronomical study and observations.

The observed traits of this historically known skeleton provide a critical aspect when establishing the biological identity of studied skeletons, mainly the age of an individual, where great differentiation of the traits has to be expected depending on various circumstances. Sometimes the detailed analysis of the bones may also be a good indication of the professional activities of the studied individual.

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