

Andreas Vesalius on the Preparation of Osteological Specimens

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Abstract

In 1543, Andreas Vesalius dissected and prepared the skeleton of a murderer called Jakob Karrer, and gave the specimen to the university of Basle. This specimen, now kept in the Vesalianum Museum of this university, is one of the most ancient anatomical specimens in the world. The analysis of the initials and capital letters of Vesalius' "Fabrica" enables us to understand the procedure used by this famous anatomist to prepare human skeletons.

Introduction

Osteology is at the root of our knowledge of human anatomy. Several thousand books or dissertations were chiefly, indeed even exclusively devoted to the description of the human bones in the last six centuries (Olry, in preparation). The reason is obvious: human (or animal) bones withstand putrefaction, and therefore might be found in nature. In the early sixteenth century, the French anatomist Pierre Barot used in his lectures "human bones which had been cast up by rivers in spate" (Beau, 1933). Carnivores and insects (Megnin, 1894) were unquestionably the first producers of skeletal specimens.

Some prevesalian plates of the human skeleton

In the early second millenium, bones had an important role in sacred art. However, it was not always easy to distinguish human bones from bones of animal origin in these illustrations (Saban, 1988). In the fifteenth century (ca. 1475), Martin Schongauer, the son of an Alsatian silversmith, published the first copperplate depicting some parts of the human skeleton (skull, femur, coxal bone) (figure 1). Ten years later, the Augsburg naturalist Johannes de Cuba included in the German first edition of his "Ortus sanitatis" the first woodcut of a human skeleton (1485) (figure 2). In 1493, an almost similar plate was published by Richard Helain (figure 3), and Michael Wolgemut and his son-in-law Wilhelm Pleydenwurff made a drawing of dancing skeletons



Figure 1. Human bones in a "Crucifixion" by Martin Schongauer, 1541 issue (taken from Saban, 1988).

to illustrate Harmann Schedel's Nuremberg Chronicles (figure 4). However, none of these illustrations had any claims to anatomical accuracy, and nothing is known about the dissection and preservation procedures.

The skeleton of a murderer prepared by Andreas Vesalius

During his stay in Basle (first five months of 1543), Andreas Vesalius gave many lectures and dissection courses, published his celebrated "De humani corporis fabrica libri septem", and prepared numerous anatomical specimens. One of them, a human skeleton, was given to the university by Vesalius himself: it has to be considered as one of the most ancient preserved anatomical specimens to date (Huard and

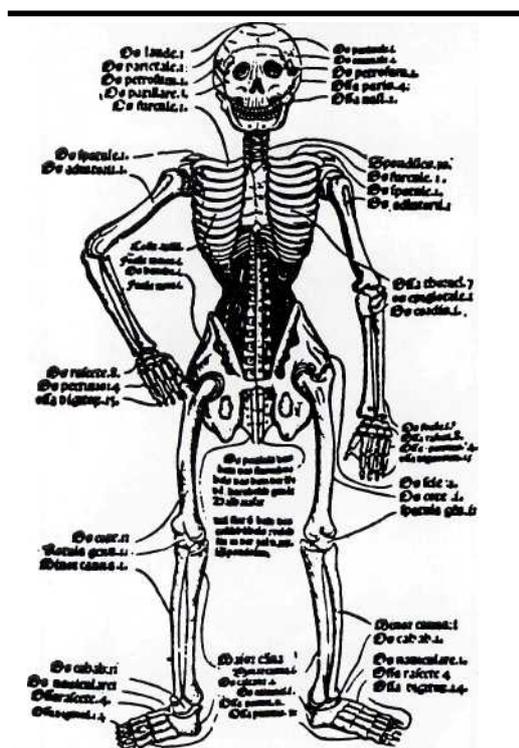


Figure 2. Human skeleton in Johannes de Cuba's "Ortus sanitatis", 1497 edition.

(Imbault-Huart, 1980; Kurz, 1992).

This skeleton was the one of Jakob Karrer, a notorious murderer of Alsatian origin who was beheaded on May 12, 1543 (Gast, 1548; Wurstisen, 1580). It was prepared by Vesalius in the same year, and restored in 1985 (Kurz, 1992): the mandible, both hands with carpal bones, some ribs, both patellae, the left foot and the phalanges of the right foot are lacking (figure 5). It has however to be regarded as a fine specimen of the human skeleton, showing that Vesalius was skilled in the art of dissecting and assembling the human bones. His procedures are illustrated around some of the capital letters and initials used in his famous treatise of anatomy.

The initials and capital letters of Vesalius' Fabrica

The capital letters and initials of Vesalius' Fabrica are very helpful in understanding the procedures used to prepare osteological specimens at that time (Metzger, 1935; Anson, 1944, 1949; Lambert et al., 1952; Monteiro, 1952). We will describe here the initials "C" and "P", and the capital letter "O" in both 1543 and 1555 editions of Vesalius' masterpiece (Huard and Imbault-Huart, 1980).

In both 1543 and 1555 editions, the capital letter "O" shows five cherubs who bustle about boiling human bones

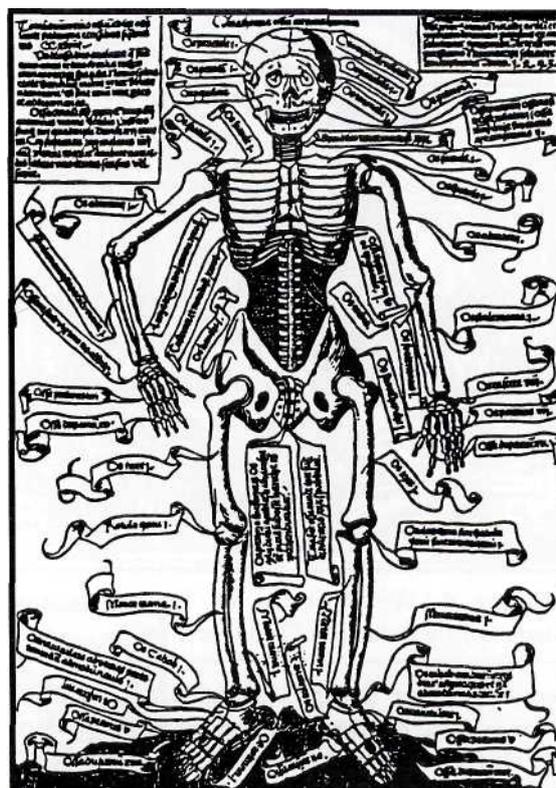


Figure 3. Anatomical plate of the human skeleton by Richard Helain, 1493 (taken from Saban, 1988).

in a pot which is suspended with a trammel (figure 6). Two cherubs are preparing to plunge a skull and a long bone into the pot, while a third one stirs up the fire. This illustration depicts the first step in skeletal specimen preparation. The bones were placed in a pot, and boiled until it became easy to remove the majority of the soft structures. It is noteworthy that some of the human bones (sternum, hyoid, sesamoids) and related structures (teeth, nails, laryngeal cartilages) did not have to be macerated, but needed only to be scraped and dried. The habit of macerating and boiling dead bodies in order to preserve only the bones had spread at the time of the crusades (Paladilhe, 1979). It was the simplest way to repatriate the corpses of the victims who wished to be buried in their native country. This procedure, called "sepultura more teutonico" became so common that Pope Boniface VIII, Benoit Caietan, decided to proscribe it in his bull "Extravagantes communium" on February 18, 1300 (Wickersheimer, 1926). Though this bull was not directed at human dissections, it influenced the famous Mondino dei Luzzi who decided therefore not to boil some parts of the skull (Olry, 1997).

In the 1543 edition, the initial "C" shows three bearded men who carry a casket, from which hangs a human fleshless hand (figure 7). The casket is full of holes, and is about to be



Figure 4. Woodcut by M. Wolgemut and W. Pleydenwurff for Schedel's *Chronicles*, 1493.

immersed in a river. In the 1555 edition, this initial depicts the same subject, but the three bearded men were replaced by four cherubs (figure 8). This initial illustrates the second step of skeletal specimen preparation. After having removed the majority of the soft tissues, the anatomist covered the specimens with lime and placed it in a perforated wooden casket for a time. Subsequently, the casket was firmly tied down at the bottom of a river, where the current gradually removed the remaining soft tissues as it flowed through the casket.

In the 1543 edition, the initial "P" shows three cherubs who put together some bones to reconstruct a skeleton which is partly visible at the right border of the illustration (figure 9). In the 1555 edition, the same scene is depicted, but the cherubs are now four in number (figure 10). This illustration shows the last step of skeletal specimens preparation. The lower and upper limbs were first assembled with copper wire, and the vertebral column was then fastened to a metal rod (Monteiro, 1942; Brocas, 1958).

Discussion

Andreas Vesalius is unanimously regarded as one of the pivotal figures in the history of anatomy. The very new English translation of the first two books of his famous "Fabrica" by William Frank Richardson and John B. Carman (1998) attests to the outstanding importance of this treatise. Vesalius broke new ground compared to his predecessors: he dared criticize Galen's hegemony, and entrusted artists with the task of illustrating his treatise. Both of these points were revolutionary in anatomy at that time. To my knowledge, Vesalius was also the first anatomist to illustrate some of the

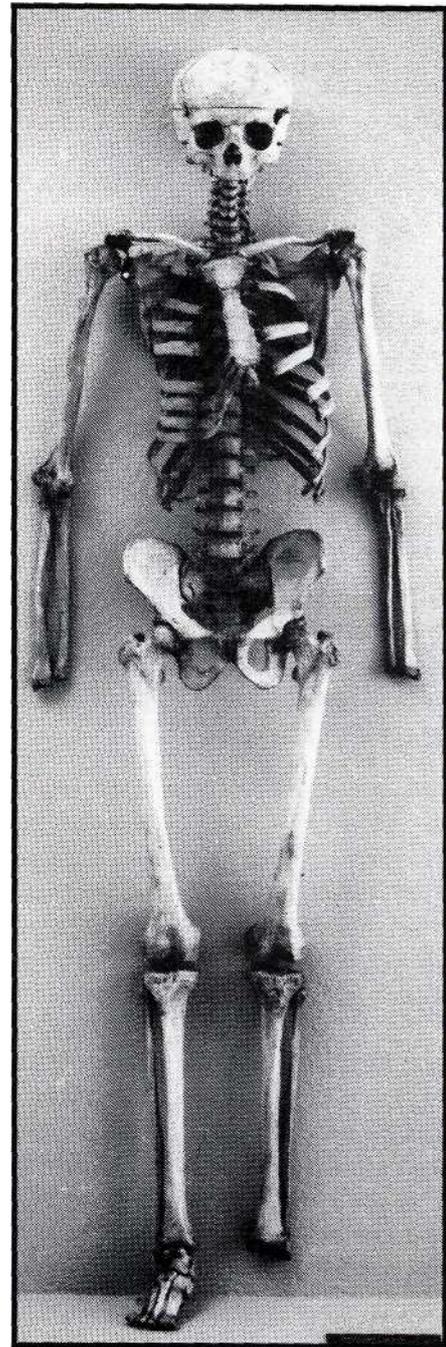


Figure 5. Jakob Karrer's skeleton prepared by Andreas Vesalius (taken from Kurz, 1992).

dissection and preparation procedures around the initials and capital letters of his book. Without any doubt, the "Fabrica" has not yet given away all its secrets.

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Figure 6. The capital letter "O" in both 1543 and 1555 editions of the Fabrica.



Figure 7. The initial "C" in the 1543 edition.



Figure 8. The initial "C" in the 1555 edition.



Figure 9. The initial "P" in the 1543 edition.



Figure 10. The initial "P" in the 1555 edition.

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