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6. Bone preparations and the end of aesthesis

In the previous chapters it has been made clear that aesthesis in eighteenth-century anatomy was characterized by several factors: gaining knowledge through sensory perception; searching for perfection and elegance; dealing with disgust by either using visual or literary strategies; seeking systems and meanings in the negatives of deformation and pathologies; and a stabilization and categorization of the human body through commodification and decoration. All these aspects can be retraced through the materiality of the eighteenth-century Leiden anatomical preparations. Aesthesis in anatomy was a particular epistemic culture, tacit and fluid. Like any epistemic culture, it did not last forever. It is as equally hard to discern when it first appeared as when it eventually disappeared. I argue that the end of aesthesis coincided approximately with the end of old anatomy and physiology as described by Cunningham.¹ This chapter uses the materiality of a very particular kind of anatomical preparations to gain an understanding of the end of aesthesis: bone preparations.

The preparations discussed so far were mostly wet preparations of soft tissue. There are several reasons for this. First, wet preparations form a substantial part of the collections; over thirty per cent of the eighteenth-century preparations remaining today are preserved in fluid.² Second, wet preparations were still a relative novelty at the start of the eighteenth century, and thus developed and changed much quicker than the already existing dry preparations and preparation techniques, which had been around since the Egyptians first created mummies. Finally, wet preparations are often more visually appealing and evocative than dried preparations, as dried preparations of soft parts are often especially difficult to identify for those without

¹ Cunningham 2002, 2003.

² 2490 preparations of 8170 in total.

medical training. Many wet preparations, with their lifelike looks of pinkish and red soft tissue, or their decoration of lace-rimmed sleeves and bead necklaces, are more easily recognizable as humans or parts of humans than dried soft tissue preparations, and thus easier to identify with.

Although wet preparations look more clearly manufactured than dry preparations, the latter, either of soft tissue or bones, are still *preparations*, not some kind of *objets trouvées*.³ Bones constitute a particularly interesting ontological problem here, as they initially appear to be just that: bare bones. Yet in the process of preparing, using, and displaying bone preparations, their materiality changed; they became artifacts and were invested with new meanings. This latter transformation has been vividly revealed by the historian of medicine Anita Guerrini regarding the skeletons in the collection of the French anatomist Joseph-Guichard Duverney (1648-1730), which hold a variety of meanings: emotional, moral, religious, medical, and scientific.⁴ She has also pointed out that we lack a history of the skeleton in the eighteenth century.⁵ Although I do not want to profess that I write such a history in this chapter, I do aim to understand how a changing idea of aesthetics shaped several types of bone preparations in the eighteenth-century Leiden anatomical collections. I argue that the bones and skeletons in these collections of this period had fluid meanings that could change over time, and that aesthetics defined much of those meanings and changes. Starting from an iconic skeleton and a wet bone preparation, I will show that what at first sight appears to be one kind of fairly straightforward naturalia –bones and skeletons - were actually artifacts that were defined by aesthetics and which had diverse meanings and uses within one institutional collection, all within a relatively short space of time. But before we can focus on these particular preparations, we need to briefly consider what was so far known up to this point concerning these skeleton and bone preparations in the eighteenth-century Leiden anatomical collections.

³ The obvious exception to this would be bones robbed from old graves, yet as these also needed to be cleaned and selected there appears to be a manufacturing and commodification aspect adhering even to them. Excavated bones were not very popular with anatomists, as they were often too badly damaged to be of any use. However, scarcity meant that anatomists could often not be too picky. (See i.e. Rosner 2010, Santing 2008, p. 59)

⁴ Guerrini 2003a.

⁵ Guerrini 2004, p. 229.

Approximately 2500 of the more than 8000 preparations in the Leiden anatomical collections today are of bones, and of some of the historical bone preparations we know quite a lot about how they were used and perceived at the time. For example, we know that the collection contained human skulls, collected by Leiden anatomy professor Otto Heurnius (1577-1652) from around the world, and that by the early eighteenth century the Leiden anatomical theatre was decorated with skeletons of humans and animals [Ill. 58].⁶ It is also known that S.J Brugmans' collection of skulls with gunshot and sabre wounds was collected on battlefields in the late eighteenth and early nineteenth centuries to learn more about the impact of external trauma on the skull [Ill. 30], and that Gerard Sandifort, Eduard's son, listed and depicted a series of skulls of people from different parts of the world during the last decades of the eighteenth century, as this fitted with the contemporary interest in phrenology and concepts of race.⁷ Yet almost nothing is known concerning the use, making, and collecting of skeletons and bone preparations in Leiden anatomy in the eighteenth century.

I will use two case studies with which to fill this void. For once, I will not start from a preparation but from illustrations of a preparation by Albinus. This case is a little exceptional in terms of a case study of the materiality of the eighteenth-century Leiden anatomical collections, both because the skeleton that served as its model disappeared, and because it is accompanied by a text in which the mostly tacit aspects of aesthesis are for once voiced quite explicitly. However, the illustrations are similar to Albinus' anatomical preparations in the sense that in both cases he has produced refined, polished anatomical objects that are only distant reminders of the gory, messy reality of anatomical practice. The lost materiality of the portrayed skeleton will serve as a starting point for understanding the hands-on practices, ideals, and bodily involvement of making a bone preparation.

Subsequently, I will use a preparation by Van Doeveren to explore thus far virtually ignored differences between the uses and meanings of wet and dry bone preparations throughout the eighteenth century. The elements of aesthesis which emphasize seeking perfection, gaining knowledge through sensory perception and hands-on work, dealing with disgust, and commodification, influenced all these

⁶ Huisman 2009.

⁷ Elshout 1952, p. 102-103, G. Sandifort 1827 Vol. I, *Introduction* p. IX.

objects to various extents. This resulted in a wide variety of composition, preservation, and display. However, by the end of the eighteenth century the epistemic culture of aesthetics started to change and disappear, and that too can be understood from the materiality of the eighteenth-century Leiden bone preparations.

Albinus' perfect skeleton, or the hands-on practices of making bone and skeleton preparations

For Bernard Siegfried Albinus, professor of anatomy at Leiden University from 1721 to 1770, the human skeleton played a central role in his work. Just how important it was for him already shows from one of the few portraits made of him during his life: in it, a curtain behind him is pulled aside to reveal a skeleton [Ill. 59]. In 1747 Albinus published his magnum opus: an anatomical atlas of the bones and muscles perspicuously titled *Tabulae Sceleti Et Musculorum Corporis Humani*. Much has been written about this brilliant atlas and the hugely popular plates in it, yet the actual bodies used for the illustrations have until now gone largely undiscussed.⁸ Yet it is the actual hands-on laboratory work on the material of the skeleton that was the model for these plates that exemplifies the paradoxical contrast between the corporeal gore and effort of the original materials and the clean and polished final result, in which the visceral materiality of the original has entirely and purposely disappeared. In order to understand Albinus' work on skeletons, we need to know more about contemporary practices of preparing and conserving them. In this section I will therefore start with an exploration of the practicalities of making dry bone preparations in general, and in other uses of bone, before moving on to the corporeal practices advocated by Albinus in his atlas.

As we have seen, dry preparations of bones and skeletons were very important in the seventeenth-century Leiden anatomical theatre, not least because the skeleton was considered to be the foundational structure of the human body. This also appears from the iconography of the famous 1543 anatomical atlas by Andreas Vesalius (1514-1564), *De Corporis Humani Fabrica*, which can be considered the grand predecessor to Albinus' atlas. In the seventh book, the anatomy of the human body is represented in a series of plates, showing different stages of dissection and thus different layers of tissue and bone. All bodies are positioned in Arcadian landscapes, some with a city or

⁸ Elshout 1952, Punt 1983, Huisman 1991, Hendriksen 2010.

a ruin visible in the distance. The closer to the bones the body is depicted, the emptier, more devoid of human intervention the landscape appears to be, suggesting that the skeleton is the ultimate constitution of man, far removed from the woes of civilization. In the plates of the full skeleton, stripped of all soft tissue, the draughtsman has reverted to the ultimate Renaissance memento mori theme: the skeleton is contemplating mortality over a human skull, placed on a tomb [Ill. 60].⁹ But in order to have these plates made, preparations had to be created.

Before the late seventeenth-century invention of wet preservation of specimens, it was simply impossible to create lasting wet preparations.¹⁰ The first dry bone preparations were either not preparations at all – in the sense that they had not been intentionally preserved but acquired from graves – or preparations made using techniques that were based on natural processes of decay, such as wet maceration: the cleaning of a skeleton of the last bits of soft tissue by lowering it in a pierced case in running water, or letting it decompose in water that is frequently refreshed.¹¹ Vesalius in his atlas already recommended the repeated washing of a cadaver with slaked lime and water.¹² Other tested methods of creating bone preparations involved the removal of soft tissue by the use of maggots and the boiling of bodies and body parts.¹³ By 1790, Pole still recommended wet maceration as the most effective way of preparing bones and skeletons, although it required patience: three to six months depending on the weather. Of course boiling was quicker, but the downside of that method was that the heat might cause the remaining medullary oil in the bones to penetrate the compact substance and thus give them a ‘disagreeable oily transparency’ and which ‘spoils them of their Beauty’.¹⁴ Moreover, one seventeenth-century handbook writer noted, the marrow containing the medullary oil should not be discarded after extraction, as it could be used for other purposes – purposes apparently so commonly known that he thought it unnecessary to specify them.¹⁵

⁹ Vesalius 1543. The book, including the plates can be viewed on < http://www.nlm.nih.gov/exhibition/historicalanatomies/vesalius_home.html > (last consulted 23 March 2012).

¹⁰ See chapter 2 for a more extensive discussion of the development of wet preparation techniques.

¹¹ Sturm 2007, 377.

¹² Ibid.

¹³ Ibid.

¹⁴ Pole 1790, p. 99-100, Lyser 1740 (1665) p. 228.

¹⁵ Lyser 1740 (1665) p.236-7. This is not as odd as it may seem. As recent research by Richard Sugg (2011) has shown, corpse medicine, the use of human bones, as well as human skin, blood, hair, and

Yet bones, especially dry preparations of healthy bones and particularly complete skeletons, served primarily as teaching material and mnemonics, as appears from Lyser's 1665 anatomical handbook – a manual reprinted and translated well into the eighteenth century, and recommended to students by Herman Boerhaave.¹⁶ Lyser states that a preserved dry skeleton is the next-best method for studying the 'Figure and Shape of the human Bones' after fresh in-situ bones. Throughout the eighteenth century, the general idea of a successful dry bone preparation was that the bones were thoroughly cleaned, attached to one another in the natural order either by the ligaments or in a manner that allowed the user to move the limbs, and that it was as white as possible.¹⁷

That desired whiteness may seem odd, as bones in the living body are not white at all, but white is traditionally associated with purity, cleanliness and death. The preference for white bones can also be found with Ruysch, who repeatedly mentions whiteness as a desirable characteristic of bone preparations, for example in the preparation of a 'very white skeleton of a mole'.¹⁸ These rules-of-thumb ensured not only that the skeletons looked beautiful but also that the bones were less prone to decay and thus could be used for the study of normal human anatomy for a long time. How, then, did Albinus use skeletons and bone preparations in his work?

As previously stated, one of Albinus' big projects, and maybe his grandest, was the creation of his anatomical atlas, the *Tabulae Sceleti Et Musculorum Corporis Humani*, about which he started thinking as a student. He wanted to create an anatomical atlas that was more accurate than any of the atlases available at the time.¹⁹ This was not an unusual ambition for an anatomist – many created their own atlases, prestigious, expensive volumes, with the help of skilled craftsmen such as draughtsmen and engravers. In fact, there was a strong reciprocity between iconography and anatomy in early modern Europe. As Hallam has pointed out, mori

fat as *simplicia* for drugs, was quite common in Western Europe until the eighteenth century. As the anatomical theatre was one of the few places in the seventeenth century where human remains were relatively easy to obtain, it is not unthinkable that in Leiden too remains that could not be used to create instructive and moralizing decorations for the theatre were sold to apothecaries as *simplicia*.

¹⁶ Boerhaave did so in his work on 'studying physics', according to Thomson's preface, to his 1740 translation of Lyser, p.5.

¹⁷ Lyser 1740 (1665) p. 226, Pole 1790, p. 99-100.

¹⁸ Ruysch 1744, p. 722. Whitening the bones may also have been a successful strategy in the commodification of the skeleton. It is not hard to imagine that a clean-looking, white skeleton is both less disgusting to handle and easier to trade than a grubby yellowed one.

¹⁹ Punt 1983 p. 15.

objects like skeletons carved in ivory were often created by the same craftsmen who sculpted miniature anatomical manikins for use as 'instructive tools' by doctors in medical training in northern Europe.²⁰ These craftsmen in their turn obtained their knowledge of human anatomy in the anatomical theatre, from the dissections and the human skeletons on display there. In *mori* objects, such as ivory skeletons, *vanitas*-paintings, and the skeletons on display in the early Leiden anatomical theatre, anatomical realism and 'memento mori' symbols were fused. This led to layered objects, which were both reliable instruments for anatomical instruction and subjects for spiritual contemplation.

However, Albinus was not very interested in *memento mori* symbols – he wanted the atlas to be as clean-cut and clear as possible. The Arcadian landscapes in the background of the plates, and the rhinoceros Clara, were only added at the instigation of his draughtsman, Jan Wandelaar, who thought they would benefit the sense of scale of the skeletons and *ecorchés*.²¹ As Albinus was so obsessed with perfection, the production of the atlas occupied him for the rest of his life. Only the parts dealing with the bones and the muscles were finished when he died; a few sketches for the part on the internal organs remain. The creation of the atlas, especially the technicalities of the production of the plates, and the details of the cooperation between Albinus and his draughtsman, has been discussed extensively elsewhere.²²

But in order to make the plates, Albinus obviously needed a body, (more than one in fact, as bodies deteriorate quickly), and he did not only depict the full skeleton, but also all the separate bones and the different layers of muscles. What Albinus recounts of the process of selecting and maintaining bones and skeletons for the production of his atlas is in fact very enlightening. Paradoxically, the lost materiality of Albinus' model skeleton sheds light on the corporeal and sensory involvement of anatomists with the materiality of the Leiden collections in a broader sense.

In the preface to his anatomical atlas, Albinus describes the difficulties he encountered with his material during the production of the plates. The first part of

²⁰ Hallam 2001, p. 65.

²¹ Huisman 1991, p.14, for more on Clara see Verheij 1992.

²² See Elshout 1952 p. 53-55, Punt 1983 p. 14-68, Huisman 1991, Kemp 1993 p. 107-112, Cunningham 2010 p. 253-262, Hendriksen 2010 p. 22-34.

the atlas was on the skeleton, as Albinus considered the skeleton to be the foundational structure of the human body. He wanted to reach a level of detail unprecedented in other anatomical atlases: first the full skeleton had to be depicted from three different sides (front, back, and sideways), and then all the bones had to be depicted and described individually.²³ For the depiction of the full skeleton, Albinus wanted a specimen that was fully grown, a state that he defined by the epiphyses being fully developed and attached to the bones. This indicates that Albinus considered the young adult human skeleton to be perfect; childhood was a formative but imperfect phase, and after a certain age, decay set in. This attitude towards childhood was common in anatomy until the early eighteenth century. However, unlike his seventeenth-century predecessors, Albinus was also interested in that formative stage, as we will see in the next section.

For the depiction of the anatomy of the human body, however, Albinus wanted an adult skeleton. He eventually found an ideal one, one that met all his criteria of elegance and beauty:

“It was of the male sex, of a middle stature, and very well proportioned; of the most perfect kind, without any blemish or deformity, either as to the bones themselves, or their connexions with one another. And as skeletons differ from one another, not only as to age, sex, stature, and perfection of the bones, but likewise in the marks of strength, beauty, and the make of the whole; I made choice of one that might discover signs both of strength and agility; the whole of it elegant, and at the same time not too delicate; so as neither to shew a juvenile or feminine roundness and slenderness, nor on the contrary an unpolished roughness and clumsiness; in short, all the parts of it beautiful and pleasing to the eye.”²⁴

It sounds too perfect to be true, and it actually was, Albinus admitted. But that was the good thing of making an anatomical atlas: unlike in a preparation, where the anatomist could only correct blemishes and irregularities to a certain extent, in the

²³ Albinus 1754, preface p. v.

²⁴ Ibid., preface p. xiv. Tour guides in the Leiden Museum Boerhaave have suggested that the arms of the skeleton in Albinus' plates are too long and that 'a specialist' has declared that they are not human but chimpanzee bones. However, it is quite unlikely that Albinus would deliberately have used chimpanzee bones to depict his 'homo perfectus'; it seems to make more sense that the relatively long arms are either the result of some kind of optical distortion in the drawing process or of Albinus' peculiar ideas about the perfect proportions of the body.

plates he could correct every single one of them. To Albinus, this was not some kind of artificial beautification. In fact, he wrote: ‘by this method it is possible to express the perfection of nature, at least to come very near it’.²⁵

So Albinus had his (almost) perfect skeleton, but having the drawings made was a lengthy, arduous process. Albinus wanted to put up the skeleton with the ligaments and cartilage attached, in order for it to appear as natural as possible, and he draped it in a rather complex position, using chords to keep it that way. But because he kept the ligaments and cartilage, he could not clean the bones with the traditional maceration methods, nor did he want the whole to dry out, as he felt this would negatively affect the natural looks of it. This meant the skeleton was prone to decay, especially as the room in which the draughtsman Jan Wandelaar was working had to remain slightly heated. This had nothing to do with considerations about cold hands: Albinus had come up with the luminous idea of positioning a very skinny man next to the skeleton in the same position so as to help Wandelaar get it right, but the man demanded for the fire to be kept on at all times – not surprising as the work took place during winter months. In order to make sure the skeleton lasted long enough to finish the drawings, about three months, Albinus had to tend to it continuously:

“...it was necessary to take care, that the skeleton should not suffer from drying or putrefaction, nor were hindered from going on from the same causes. Sometimes then, when it dried too much, I moistened it with water, and cutting the ligaments, poured it into the joints, in order to preserve the cartilaginous crusts; and again, when the putrefaction was to be checked, I sprinkled it with vinegar; wrapped it up in the night time with paper, and cloths dipped in the same liquor; and poured some of the same wherever there was room for it.”²⁶

Here we once again see the curious mix of wanting to find and display perfection and elegance in anatomy and the undoubtedly stinky, sticky, disgusting messiness of anatomical practice. It could be argued that the world was a dirtier, smellier place in the eighteenth century, and that therefore a chore as described above would have filled Albinus with less disgust than it would us. Alberti has argued that the wonder and disgust experienced by people in other times differs from our

²⁵ Albinus 1754, preface p. vi-vii, xiv.

²⁶ Ibid., preface p. X.

own experiences upon encountering the same situations and objects.²⁷ However, eighteenth-century accounts of experiencing disgust upon witnessing the inside of the human body make it clear that this is a form of core disgust that had to be overcome by anatomists back then just as much as today. The lawyer and poet Willem Bilderdijk for example, stated in a 1783 thesis on the beauty of the human body:

*“Because it is in the first place the idea of the soulless, the dead, of the corpse itself, which (notwithstanding its appearance) both in the dissected body and in all other corpses evokes disgust.” (...) Added to this, second, is the realization of abuse, which we receive from the contemplation of cut, slashed, skinned and maimed corpses. The idea of the human body is too closely connected to our idea of ourselves not to cause a comparison and a transition of ideas, and can evoke a kind of pity, which sometimes can move the intestines, and which is no less powerful because it is unreasonable.*²⁸

Once we are aware of these tendencies, Bilderdijk continues to argue, we can set them aside and get used to the seeing of, and dealing with, death bodies, and continue to seek the beauty within their structures.²⁹ Yet even for an experienced anatomist like Albinus, who was aware of the general human tendency to experience the anatomized body as a disgusting reminder of our own vulnerability and mortality, handling corpses cannot have been a walk in the park. His awareness of the disgusting aspects of anatomy is expressed in his preparations and his atlas images, in which he tried to – sometimes literally - cover up the reminders of human vulnerability and mortality and to bring out the ideal, beautiful human body. Moreover, Albinus, the man of whom we might think is the ultimate example of anatomical *sprezzatura*, judged by his atlas plates and preparations, happily

²⁷ Alberti 2011, p. 195.

²⁸ Bilderdijk 1783, appendix V, p. 131-132: *“Want, in de eerste plaats is ‘t het denkbeeld van ‘t ontzielde, van ‘t doode, van ‘t lijk-zelf, dat (ongeacht deszelfs gedaante) in ‘t ontlede Lichaam even als in alle lijken den afkeer opwekt.(...) Hier bij kooft, ten tweede, ‘t besef van mishandeling, het welke wij door de beschouwing van opengesneden, gekorven, ontvelde, en verminkte lijken ontfangen. Het denkbeeld van ‘t menschelijk lichaam is te na aan het denkbeeld van ons-zelven verbonden, om hier geen vergelijking en overgang van denkbeelden te veroorzaken, en ons een sort van meelijden te doen ontstaan, dat somtijds de ingewanden beroeren kan, en niet minder kracht heeft om dat het onredelijk is.”*

²⁹ Ibid., p. 132-133.

admitted to the bodily discomfort of creating these images and objects in his writing, speaking of the ‘pains, labour and expense’ they required [Ill. 61].³⁰

In Albinus’ work on the creation of his anatomical atlas we once again see all the aspects of aesthesis. He sought an ideal, beautiful body, using his sensory experiences of it to create images of an even more ideal body, something that could only be done through a lot of practical, hands-on work. That work was often dirty and arduous, yet dealing with the disgust it provoked, Albinus admitted, was a necessary exercise in creating anatomical objects that optimally showed the perfection of the human body. It is fascinating to note that although he readily admitted to the material and visceral reality of the skeleton that was used as a model for his atlas, Albinus did not care to mention what happened to it eventually. Unlike Vesalius, who created skeleton preparations as well as an anatomical atlas to teach anatomy, Albinus purposely made the atlas the sole product of his project.³¹ He got rid of the material, messy reminder that was the almost-but-not-entirely perfect skeleton, maintaining only the clean atlas plates.

The absence of the materiality of the model skeleton in this case first seems to distinguish it ontologically from the other cases in this book. Yet Albinus’ attempt to map his physical involvement with the material he used in the plates and preface of his atlas shows that he felt it was important to inform the user that although the original skeleton was lost, this was still the elegant product of his own sensory perceptions, dealings with disgust, and hands-on skill. And it was not in vain: like Albinus’ preparations, the results of his visceral efforts were stunning and highly successful. The expensive atlas and its plates were a popular and much-plagiarized collector’s item, and Albinus’ preparations were equally admired and copied, as shows from a similar wet bone preparation by Van Doeveren, using the style and technique of his teacher [Ill. 28].³²

Wet bones, dry bones: osteogenesis and ossa morbosa

It has long been known that the eighteenth-century Leiden anatomical collections contained both wet and dry bone preparations; both kinds are listed in eighteenth-

³⁰ Albinus 1754, preface p. XXIV.

³¹ One of the skeletons prepared by Vesalius is still on display in the Anatomisches Museum Basel (Switzerland).

³² Ad0003, a vertebral column of a six months old foetus, from the collection of Van Doeveren.

century catalogues of the anatomical theatre and in the 1793 first volume of the *Museum Anatomicum*. It is not hard to imagine that dry and wet preparations both have their pros and cons in terms of preservation and handling, but why exactly was a particular method chosen for a particular preparation? And furthermore of course, what role did aesthetics play in these choices? In this section, I use a wet and a dried preparation to trace the development of techniques of bone preparations in Leiden in the course of the eighteenth century. Based on that history, I will argue that specific methods of preservation suited different yet related fields of anatomical inquiry, leading to the simultaneous use of various preservation methods in the Leiden anatomical collections, but noting that in keeping with aesthetics, considerations about the elegance and perfection of the resulting preparations always played a part.

In the collection of Wouter van Doeveren we find a number of wet bone preparations like this one, a vertebral column of a six months old foetus.³³ It is a nice preparation, showing very well the still largely cartilaginous structure of the vertebrae. Six other preparations of bones of foetuses, a newborn, and an infant remain in the Van Doeveren collection, forming the majority of his few bone preparations. The need for dry bone preparations seems obvious, but why would one want to make a wet preparation of bones? This can be understood from a shift in anatomy from a search for the normal, average, adult skeleton to questions of generation. For example, Lyser still recommended an adult skeleton for the study of anatomy, as he believed these were more durable and more perfect than the skeletons of children and even adolescents. Interestingly, he stated in 1665:

“We indeed often see Infant Skeletons in Anatomical Theatres and the Repositories of Anatomists; but these serve more for Ornament than real Use, and are made up in a quite different Manner to adult Skeletons”³⁴

This suggests that although he was aware of the fact that the proportions in a child’s skeleton are very different from those of an adult skeleton, he was not particularly interested in those differences – he appears to have thought of childhood as an imperfect pre-stage of adulthood - and even thought the preservation of children’s

³³ Adoo03.

³⁴ Lyser 1740 (1665) p. 227.

skeletons a bit whimsical. That attitude would change in the eighteenth century with the growing interest in the source and force of life, although the entire adult skeleton, as well as separate bones, healthy and diseased, also remained objects of study throughout the eighteenth century.

By the late seventeenth century, the Briton Clopton Havers (1657-1702) had discovered that bones are full of microscopic veins and canals. This led Boerhaave to develop the idea that bones were formed through the apposition of membranes.³⁵ Probably inspired by these developments, Rau first developed the technique of creating nearly transparent wet bone preparations, particularly of foetus and infant bones, in the late seventeenth or early eighteenth century.³⁶ Why did Van Doeveren create these few, particular bone preparations so many years later? In order to understand that, we have to look again at the man who first taught him anatomy when he was a student in Leiden: Albinus. When Albinus was appointed as lector of anatomy in 1719, the status of the existing Leiden anatomical collections was to change for good.³⁷ Albinus dutifully made a catalogue of the collection of his predecessor and teacher Rau, which consisted mainly of surgical instruments. But in the Rau collection, there were also at least thirty-five wet preparations of children's bones.³⁸ These must have been inspiring for Albinus, as he was fascinated by the structure of bodily tissue and the question of the force of life, of that which distinguishes living from lifeless matter.

As we have seen, Albinus thought of the skeleton as the foundational structure of the body, and the structural element of the skeleton was the fibre. He therefore believed that he could understand the nature and generation of all bodily tissue from that of the bones.³⁹ One of his big projects was therefore the study of osteogenesis, or the generation of the bones. Although there were several bones and skeletons in the Leiden collection, these dry preparations were of little use to someone who wanted to know how bone generated and developed. Albinus therefore further developed the wet preparation technique for bone preparations that allowed him to make bones, especially of foetuses and children, transparent, and to clearly show the tendons and

³⁵ Boerhaave et al. 1983, p. 315.

³⁶ Elshout in the 1950s catalogue of the anatomical collections noted on Van Doeveren's wet bone preparations that the manner of preparing is different from that of Rau and Albinus, that it somehow looks more modern.

³⁷ Also see chapter 3.

³⁸ Albinus 1725, p. 18-21.

³⁹ Albinus 1737, p. 6., Punt 1983, p. 88.

structure of the bone. This new interest in the development of bone structures gave new importance to the skeletons of fetuses and infants, which, as shown above in the previous section, were earlier dismissed as imperfect, irrelevant or whimsical.

Albinus must have developed this technique mainly by instructions from Rau, as his old teacher seems to have been the only one with a collection containing similar preparations in the first two decades of the eighteenth century. Albinus' father for example, Bernard Albinus (1653-1721), still collected mainly dried bones, as appears from the account given by a German student in 1711 (when B.S. Albinus was only fourteen). This student, named Erndl, mentioned that 'Dr. Albin' showed him 'two Articulations of a human Finger that were petrified [dried, MH], in which all the Apophyses [epiphysis] were to be seen accurately express'd.'⁴⁰ So apparently it was possible to make a satisfactory dried bone preparation showing the epiphysis, but what was considered a flaw in dry bone preparations, an oily transparency, turned out to be a valuable asset in a wet bone preparation. This transparency allowed for the study of the internal structure of the bone without having to have access to a fresh body for dissection, and actually provided clearer views of internal bone structures than in fresh bones.

Apart from these practical benefits, Albinus' wet bone preparations served as the material, anatomical proof in a physiological debate. Around 1740, the theory of preformation was still generally accepted. This theory held that the human being does not gradually emerge from undefined material, but is already rudimentarily present in either the male semen or the female ovum – the advocates of these locations of origin were called animalculists and ovulists respectively.⁴¹ From observations of embryological development, Albinus learned that the extremities developed from the embryo as from an immobile bud. Combined with the preparations he created of foetal and infant bones, this led him to argue that the embryo was not a preformed human, but only an imperfect rudiment of a human, developing slowly under the influence of the *enormoun* (ενορμου), a sort of driving force of the bodily fluids derived from nutrition.⁴² The bones emerged from the gelatinous embryo and gradually became more solid, until, after about thirty years,

⁴⁰ Erndl 1711, p. 59 An epiphysis is a part of a bone that ossifies separately and later becomes attached to the main part of the bone, or the end of a long bone.

⁴¹ Punt 1983, p. 102.

⁴² On *enormoun* in eighteenth-century physiology also see Van der Korst 2003, p. 34-6.

they had reached their perfect state. After that, their perfection decreased again.⁴³ So where Lyser had simply denounced preparations of children's skeletons as 'imperfect', and thus not relevant, almost a century earlier, Albinus prepared the imperfect skeletons of foetuses and infants precisely to understand the genesis and development into perfection of the human bones.

These unique wet bone preparations, together with Albinus' atlas project, quickly brought him lasting international recognition as a specialist in the subject of osteology and osteogenesis. The German physiologist Albrecht von Haller (1708-1777), who met Albinus when he traveled through Holland in 1725-1727, stated that Albinus' bone preparations of foetuses were better than those made by Ruysch, and much more detailed:

*"He [Albinus] prepared the bones of a child the size of a big nut in such a way that one can discern all the bones of the hands, and the head with the dilated mouth..."*⁴⁴

Albinus' English friend and colleague, Robert Nesbitt (? – 1761), in the dedication to his 1736 book on osteogenesis, once again stressed how important it is that the transfer of anatomical knowledge is supported by either demonstration or preparations, and mentions that he took Albinus' preparations as an example for his own:

*"...I was obliged, in order to prove to my hearers the truth of my descriptions, to make a large number of preparations very different from what I had ever seen in any anatomical museum, except for that very curious one of professor Albinus at Leyden. When you examined those preparations, you was pleased to approve of them; because each part, I designed to describe, was preserved in natural shape and colour."*⁴⁵

The reason these preparations kept their natural shape and colour was due to the new wet preservation technique Albinus and now also Nesbitt used; Nesbitt stated that

⁴³ Punt 1983, p. 102, Box 1741-1742, f.576-7.

⁴⁴ Von Haller 1958 (1725-1727), p. 93: *"In den Knochen aber eins Kindgen, wie eine große Nuß groß, so zubereit, daß man alle Knochen der Händen, dem Kopf und aufgesperreten Mund (...) an ihrem Orte kan liegen sehn."*

⁴⁵ Nesbitt 1736, p. v-vi.

skeletons drawn from dried preparations look very different from their ‘natural state’.⁴⁶ Here he indeed had a point. Although a thoroughly cleaned, dried, and whitened skeleton was a useful long-lasting teaching aid, bones are not naturally white as they are permeated with veins and nerve ends, and they shrink and discolour from the treatment that is necessary to preserve them dry. As we have seen in the previous section, Albinus went to great lengths to prevent that from happening to the skeleton he used for his atlas. With Albinus’ perfecting of the wet bone preservation technique, he once again proved that he was a master at combining sensory experiment with the creation of elegant, refined preparations in which structures remained as close to their original state as possible. Of course, the preparation shown at the beginning of this section was actually not made by Albinus, but by his student and successor Van Doeveren. This shows that he remained an example for future generations of anatomists. For Van Doeveren, wet bone preparations may also have played a role in his understanding of the development of monstra, although he does not refer to it explicitly in his writings.⁴⁷

However instructive wet bone preparations were for the study of the development of bones, they were not suitable for all aspects of osteology. Not even Albinus, the man who was famous for his refined preparations of perfect anatomy, could steer clear of pathology completely, as appears from this preparation [Ill. 29].⁴⁸ As we have seen, Albinus spent almost all his time and energy on his atlas, and on research concerning *vis vitalis* and the anatomy and physiology of the senses. If he collected pathological specimens, he appeared to only have done so if they might tell him something about his primary interests: for example preparations of conrescences and degenerated body parts may help understand the power of *vis vitalis*. Yet such preparations remained peripheral elements in Albinus’ work. In his vast collection, only seven pathological preparations, of which three are of diseased bones, were listed in 1793. As we have seen previously, that was certainly not enough for the ambitions of the new professors Eduard Sandifort and Wouter van Doeveren.⁴⁹

⁴⁶ Nesbitt 1736, p vii.

⁴⁷ For more on Van Doeveren’s ideas about the formation of monstra or birth defects, see chapter 4.

⁴⁸ Abo192 costa synostose. Four right ribs of a human, fasciated in the middle. Between the first ribs two small holes are visible. E. Sandifort 1793, vol. I, p. 180., vol. II, p. 84 and E. Sandifort 1775, *Supellex anatomica* p. 228.

⁴⁹ Also see chapter 4.

Changing uses, fluid meanings: re-appreciating bone preparations

Sandifort's and Van Doeveren's ambitions in anatomy teaching and research heralded the re-appreciation of a number of the oldest bone preparations from the Leiden collections. It is in this re-appreciation that the fluidity of the meanings of the bone preparations becomes clear once more. From Sandifort's 1793 first volume of the *Museum Anatomicum*, it appears that Heurnius' small selection of (fragments of) exotic skulls, Rau's skulls, osteogenic preparations and a couple of healed fractures, as well as Albinus' three diseased bones that he used in the study of bone formation and *vis vitalis*, were valued parts of the anatomical collections by the late eighteenth century.⁵⁰ However, these preparations were used differently by Sandifort and Van Doeveren than by the predecessors who made them.

For example, the skulls and skull fragments collected by Heurnius in the seventeenth century, as either a curious pathology or a scarce proof of the existence of the exotic other, were incorporated into the late eighteenth century by Sandifort as just another example of a particular disease or inhabitant of a certain geographical region. Moreover, the few deformed bones that served Albinus well as comparative material in his study of osteogenesis were not sufficient as teaching material for the new classes on pathology. The Leiden professors therefore also contributed to the collection of bone preparations themselves. As we have seen, Van Doeveren added a number of osteogenic preparations to the collections, and Eduard Sandifort himself compiled a collection of over one hundred human bone preparations, mostly pathological.⁵¹

This reinterpretation of existing collections and the speedy addition of large numbers of pathological preparations coincided with a shift in the fields of anatomy and physiology described by Andrew Cunningham. Cunningham argues that before circa 1800, anatomy was a 'discipline of the sword', that is, a practical, hands-on,

⁵⁰ These anatomists are all mentioned in the introduction, and their human bone preparations are listed in the *Museum Anatomicum*. This is a clear indication that they were used and appreciated by the then anatomy professors, as Sandifort also made a separate list of objects and preparations present in the anatomical theatre that he deemed no longer suitable for an anatomical collection, such as an Egyptian mummy collected by Heurnius, and some bottles with insects from Albinus' collection. (1798, Archives of the Curators 228. Transcript in Witkam 1968, appendix 38, p. 62-65)

⁵¹ LUMC catalogue. After the Royal Decree of 1815, which determined that all Dutch universities should have substantial pathological teaching collections, the Leiden bone collections would receive extensive additions with the acquisition of the collections of Bonn and Brugmans in 1822 and 1819 respectively (G. Sandifort, 1827, *Preface*) On the Leiden anatomical collections in the nineteenth century, see Huistra 2013 (forthcoming).

experimental discipline, whereas physiology was the ‘discipline of the pen’; a philosophical, largely theoretical discipline. In the last decades of the eighteenth century, this division started to shift. Slowly but steadily, anatomy, although it remained relatively hands-on, became less experimental, while physiology became increasingly experiment-based, and eventually the two merged in the new discipline of experimental physiology.⁵² This implies that as the epistemic culture of anatomy was changing, the concept of aesthesis is no longer a valid heuristic instrument in describing and understanding it. These changes also became visible in the Leiden curriculum and collections. For example, the teaching methods and topics of the Leiden anatomy professors changed. Although students still had to perform dissections and make preparations themselves to learn anatomy, handbooks became increasingly important as learning aids.⁵³ Moreover, as we have also seen above, whereas the understanding of disease had previously been a largely physiological, theoretical affair, in the course of the eighteenth century pathology increasingly became a part of anatomy teaching. By the time Sandifort and Van Doeveren were professors in Leiden, they taught their students pathology both through dissection and preparations, and not only as part of theoretical lectures on physiology.⁵⁴

These developments meant that certain aspects of aesthesis inevitably assumed a different role in anatomy: hands-on sensory experience remained essential, yet searching for elegance and perfection in anatomy and proving one’s elegant skills as an anatomist became less important. The latter also had to do with the fact that the art of making anatomical preparations had become much more common than it had been at the start of the century. Preparation handbooks had become more detailed and more commonly available, and there were simply more people around who had had sufficient on-the-job training.⁵⁵ This also appears from the speed with which bone preparations were added to the Leiden collections. The increased need for pathological bones combined with the more widespread knowledge of preparation techniques meant commodification of the body became both easier and more important in late eighteenth-century anatomy.

⁵² Cunningham 2002, 2003.

⁵³ For the increasing importance of anatomical handbooks in teaching, also see Richardson 2008.

⁵⁴ Molhuysen 1923, vol. VI, p. 215.

⁵⁵ For example, compared to Blankaart’s late seventeenth-century *Anatomia Reformata*, Pole’s 1790 *The anatomical instructor* is already much more detailed and gives clearer instructions on how to make a preparation. Hyrtl’s 1860 handbook gives even more precise recipes for injection mass et cetera.

This did not mean, of course, that making preparations had become less messy or disgusting, and although many Leiden anatomists experimented in their own homes too, the facilities housed in the same building as the theatre, the Faliede Bagijnchurch, formed a welcome escape.⁵⁶ This building thus remained a site where many preparations were made and displayed throughout the eighteenth century. Anatomy professors often kept at least a part of their preparations in their homes and private offices, but as soon as a collection was donated to, or purchased by, the university, the preparations were housed on the premises of the anatomical theatre – either in the theatre itself or in adjacent rooms.⁵⁷

In the course of the century, several extensions and refurbishments were carried out, according to the wishes and needs of the anatomy professor.⁵⁸ A stable factor was that the facilities for making preparations were mainly in the cellar of the anatomy building, out of sight of the common visitor, although the downside of this was that unpleasant fumes could travel up to the theatre. Professor Eduard Sandifort was so fed up with the stink in 1797 that he had a new extension added to the cellar, where he moved the water pump and sink, and installed a new maceration coffin, clad with lead. Three years later, at the turn of the century, a new hearth was installed for the benefit of making preparations and performing dissections.⁵⁹

These investments, in facilities for making anatomical preparations, show that by the end of the eighteenth century dealing with the disgusting aspects of doing anatomy still raised concerns for the anatomy professors. Moreover, they show that it was still important for the Leiden anatomists to gain knowledge based on their own experiments and sensory perceptions. What Sandifort had stressed in his inaugural lecture in 1772, namely that practical medicine could only be learned through dissection of both the healthy and the pathological body, apparently still rang true for him almost three decades later.⁶⁰ Yet the quest for elegance and beauty became less

⁵⁶ Molhuysen 1921, vol. V, p. 19. From the acts of the university curators we learn that B.S. Albinus in 1725 asked and gained permission to lecture on anatomy in the Auditorium of the Falide Bagijnkerk (the room underneath the anatomical theatre), because the crowd was too big for his house. It is striking that he shared the room with the English church council.

⁵⁷ Witkam 1968, p.24-39.

⁵⁸ Ibid.

⁵⁹ Ibid., p. 27-8, 29.

⁶⁰ E. Sandifort 1772, p. 6: “*Haec practicae medicinae Gubernatrix. Hac ad intimosabditosque organorum recessus paratur via, funestae mroborum exponuntur clades, tutior patet curandi methodus, & accuratior instituitur prognosis, ubi fatorum mandata rescindere non licet.*”

distinct in the anatomists' work, and although practical measures were taken to deal with the disgusting aspects of anatomical practice, deformity and pathology were increasingly considered accepted components of the changing disciplines of anatomy and physiology. Some of the aspects of aesthesis were thus waning, whereas for others the importance was growing, or at least changing, within the epistemic culture of anatomy by the end of the eighteenth century. This also means that the concept of aesthesis becomes less suitable for understanding the anatomical preparations resulting from that culture.

This chapter has shown that the appearance of different kinds of bone preparations in the Leiden anatomical collections throughout the eighteenth century – skeletons, wet bone preparations and eventually a re-appreciation and extension of the collection of dry pathological bone preparations - fitted in with the contemporary research interests of the Leiden anatomists, and resulted from the epistemic culture of aesthesis. Although the kind of preparation that was most desired changed over time, until late in the eighteenth century aesthesis was important in the creation of all kinds of preparations, and older preparations were often fairly easily invested with new meanings and uses within the collections. The 'whimsical' early eighteenth-century infant skeleton preparations gained new meanings in the light of Albinus' theory of osteogenesis, and the wet and dry preparations Albinus used to understand the formation of bone, as well as some of the oldest dry bone preparations that were collected initially as curiosities, in turn were incorporated by Sandifort in his pathological bone collections to help understand bone diseases and malformations. These bone preparations were fluid objects; sometimes used for teaching, at other times for research material, and sometimes both concurrently.

For most of the eighteenth century, seeing with one's own eyes, feeling with one's own hands, searching for and appreciating the perfection and elegance of nature, commodifying and objectifying the human body into a preservable, portable object of study, skill and admiration, all remained determining factors for the creation and collection of preparations for the Leiden anatomists. By the late eighteenth century, the Leiden anatomists, particularly Eduard Sandifort, realized very well that they were indebted both materially and theoretically to their predecessors. Yet something did change in the aesthesis of the Leiden anatomists.

Although the reliance on sensory perception and a certain hankering after the discerning of beauty and elegance in human anatomy were still important, as shows from Van Doeveren's wet bone preparations, the new volition to compare various cases or preparations in order to gain a systematic understanding of pathology started to become more influential, although the preference for personally dissected and preserved preparations remained, as shows from the investments in the preparation rooms. An anatomist still had to learn from doing with his own hands, seeing with his own eyes, overcoming the stink and gore of the dissection room to create elegant preparations that served his research and teaching activities. However, institutional collections became increasingly important in research and teaching,⁶¹ and it was now perfectly acceptable for an anatomist to also use preparations made by predecessors in his research and teaching – a tendency that would only become stronger in the nineteenth century.⁶² This shows that the epistemic culture of aesthesis in anatomy was waning by the turn of the century.

Conclusion

The analysis of specific examples of eighteenth-century Leiden bone and skeletal preparations, set against the background of such preparations in Leiden before 1800, has demonstrated a number of things. First, that skeletons and bones in anatomical collections are never just that: they are preparations, painstakingly dissected, cleaned, and preserved either wet or dry. More often than not skeletons were severed into individual bones, or a certain bone formation was separated, like the trunk, pelvis, or a joint. The parts, together making up what Alberti calls *dividuals*, are much more important for this eighteenth-century anatomical collection than entire skeletons. This seems to indicate that at least within the realm of anatomical collections, focusing on the history of human bones is more fruitful than focusing on the history of the human skeleton. Second, we have seen that whereas the complete skeleton in the seventeenth-century anatomical theatre served multiple purposes – namely those of empirical educational instruments as well as *memento mori* - the eighteenth-century Leiden bone and skeletal preparations, although also human, were of a very different nature. Although the complete, average human skeleton

⁶¹ Huistra 2011, p. 29.

⁶² The extension of institutional collections was also influenced by political issues, see Huistra 2013 (forthcoming). In England, a similar shift from privately to institutionally owned collections was visible in the nineteenth century (Alberti 2005b).

remained a basic commodity in anatomical collections throughout the eighteenth century, in the Leiden collections during this time specific parts of the skeleton, both healthy and diseased and prepared in distinct ways, served the various focus areas within the collections such as osteogenic research and the study of pathology.

Moreover, the examples in this chapter illustrated that some preparations lost part of their meanings and were invested with new meanings and uses within the collections – such as infant skeletons, old skull fragments, and pathological bone preparations. Stemming from this, the preparations in this chapter have made it clear that previous simplifications of the focus areas of the seventeenth- and eighteenth-century Leiden anatomists, such as ‘the curiosities from the old Anatomical Theatre’, ‘elegant Albinus’, and ‘Sandifort and his pathologies’, give a very fragmented impression of the anatomical collections. Certain types of preparations were made and collected more or less continuously throughout the whole of the eighteenth century, yet their meanings could change over time, as is vividly illustrated by the case of the wet bone preparations. The Leiden anatomists were skilled at re-interpreting and re-using already existent preparations, each one using his own bodily experiences with a certain type of preparation, and his own sense of elegance and perfection, in doing so. I think this would make of an attempt to write a history of *the* skeleton in the eighteenth century an almost impossible tour de force, due to its frequent fragmentation, and entanglement with other body parts, and due to the sheer scope it opens up of endless meanings and uses.

Finally, this chapter has also made clear two important things about aesthesis. One is that the aesthesis of anatomy in eighteenth-century Leiden, although rooted in seventeenth-century anatomical practice with its strong focus on sensory perception and experiment, distinguished itself from the epistemic culture of that period by the quest for, and questions about, elegance and beauty that shaped the eighteenth-century preparations, and by the less obvious presence of moral lessons. The other is that although certain aspects of aesthesis were still influencing the Leiden anatomists and their creating and collecting of preparations by the late eighteenth century, a shift was discernible from a deeply-felt need to prove one’s own elegance and perfection as an anatomist in elaborately manufactured preparations that stressed both the perfection of the Maker and the anatomist, to an attitude that focused more strongly on the collecting of occasionally elegant and perfect preparations that could

also have been preserved by others. This fits in with the changes in the character of the disciplines of anatomy and physiology that took place by the end of the eighteenth century, previously described by Cunningham. Other factors played a role as well; on the one hand there was the increasingly commonly available knowledge about preparation techniques, and the greater numbers of lasting preparations stemming from the circulation of that knowledge. On the other, new ideas about anatomy research and teaching meant greater numbers of preparations were needed, and these simply could not be assembled through the dissections done by one or two professors.

Aesthesis in eighteenth-century Leiden anatomy - the combined factors of a search for beauty and elegance, the reliance on sensory perception, a wish to deal with disgust, and the need for commodification of the human body - changed in the course of the century, as did the anatomical preparations that were the material sediments of that epistemic culture. Sometimes one aspect was more prominently present in the materiality of anatomical preparations than the others, and the ideas about the role of the most important factors – sensory perception and seeking elegance – varied and even eventually started waning, but the variously leading aspects of aesthesis had not disappeared by 1800. In fact, as Hieke Huistra points out in her book on the Leiden anatomical collections in the nineteenth century, anatomy by then still had an ‘aesthetic side’, and dealing with disgust and objectification of the body were unabatedly important aspects of anatomy.⁶³ Moreover, the discipline of anatomy changed fundamentally in the first decades of the nineteenth century.⁶⁴ Because of the changes in the extent and manner in which aspects such as seeking perfection and dealing with disgust defined anatomy, aesthesis does not work as an explanatory concept for the epistemic culture of anatomy and most of the resulting collections in the nineteenth century. The changes in how the Leiden bone preparations collections were dealt with in the last decades of the eighteenth century thus foreshadows the end of the specific epistemic culture of aesthesis in anatomy.

⁶³ Huistra 2013 (forthcoming).

⁶⁴ Cunningham 2002, 2003.

