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Chapter 1. Take the Lid off before Use

How students handled anatomical preparations

One of the most famous gothic stories in Dutch literature centres on a Leiden medical student and his finest anatomical preparation. The story starts in the depths of a stormy night. The student, as pale as the moonlight, breaks into the anatomy building. With a smelling bottle he revives the body of a hanged man in order to steal the man's head while it – he? – is still alive. The student quickly connects the head to a complex of bottles, pouches and wires. He then gags this living preparation, brings it to his room and stores it behind his bookcase. Late at night, when no one will come, the student takes out the head. He interrogates it; he microscopically examines the tears it sheds out of despair. One night, the head bites the student's finger; just as the police arrive at his door. The student pulls the head from the apparatus to release his finger and jumps through the window. The head was found dead on the floor the next morning; the student was never seen again. The only trace is a mysterious book, present in some old libraries: *Caput sedes animi. Disquisitio, qua probatur artem fungi posse vice corporis, dummodo caput supersit* ['The head as seat of the soul. An investigation, with which it is proven that art¹ can execute the duty of the body, as long as the head is still alive']. The author remains unknown until today.

The story was written by Alexander Verhuell (1822–1897). It first appeared in the Leiden student almanac of 1847; it has been reprinted ever since.² Although Verhuell suggests the story was set long before his time,³ it reflects nineteenth-century medical research questions and practices – and their ultimate, often feared consequences.⁴ Many other gothic horror stories did so as well: Mary Shelley's *Frankenstein* of course, but also the work of Jules Janin and Georges Balzac, from whom Verhuell borrowed several motives.⁵ Galvanism and mesmerism are just two of the contemporary theories that informed these writings. Among the reflected practices are body snatching and dissecting, but also student use of anatomical preparations – the subject of this chapter. Verhuell's student engaged with his treasured head just like other medical students at the time worked with their preparations: in an active, hands-on and emotionally detached manner; question-driven, outside the medical museum.

¹ *Arts*, art, can be interpreted as either 'the art of medicine' or '(the result of) human or technical skill, as opposed to nature'.

² Verhuell 1847a. The most recent reprint I have found was De Wijs, Van Boven and Praamstra 2010, 101–108. Other reprints include Verhuell 1853, 96–107; Bervoets 1983, 7–13; Van Zonneveld 1983, 160–166; Hermans and Van Zonneveld 1985, 53–57; Appel and Ross 2007, 616–621.

³ Bervoets 1982, 33

⁴ On public fears of medical practices see for example Richardson 2000; Richardson 2006; Stern 2006.

⁵ Jan Bervoets has discussed the influence of Janin and Balzac on Verhuell's work. Bervoets 1982, 32–33. Marshall 1995 is a good starting point into the research done on gothic horror and the history of anatomy. Like most of this research, it focuses on Frankenstein. See also Morton 2002, 82–89.

Most works on nineteenth-century medical education ignore the use of anatomical preparations in teaching.⁶ It is regularly stated or implied that the dissection hall and the teaching laboratory made anatomical teaching collections redundant. This view has been challenged by scholars like Erin McLeary, Samuel Alberti and Jonathan Reinarz. They have convincingly argued that the medical museum and its anatomical collections remained of major importance in teaching throughout the nineteenth century, at least in the US (McLeary) and the UK (Alberti, Reinarz).⁷ This chapter builds on their work. Extension of the work of Alberti, McLeary and Reinarz is worthwhile for two reasons. First, they focus on the Anglo-Saxon world: hence, analysing the Leiden teaching practices adds to their work geographically. Second – and more importantly – McLeary, Alberti and Reinarz pay only limited attention to the handling practices mentioned above. Since they focus on *museum* collections, student use of anatomical preparations *outside* the museum falls beyond their scope. Yet, non-museum use encompassed most of the handling practices. We will see that students needed preparations to learn their basic anatomy, become familiar with rare pathological conditions, study phenomena invisible in a fresh corpse, answer research questions, and get used to working with dead bodies. To achieve these goals, students actively engaged with anatomical collections – instead of just looking at the preparations, they *handled* them. Collections were not static entities meant to be viewed from a distance; they were dynamic, to be used in a hands-on manner. Once we start seeing anatomical collections and the preparations they contain in this way, we can begin to appreciate how they remained in use in nineteenth-century teaching practices, even though these practices themselves changed.

I will first discuss nineteenth-century Dutch medical education and then demonstrate how students worked with anatomical collections not just in the museum, but also in the lecture room, the dissection hall, the clinic and the laboratory. I will then analyse the differences between display collections and handling collections.

Nineteenth-century medical education

On Tuesday 20 August 1833, medical student Jan Bastiaan Molewater (1813–1864) started a diary.⁸ He chose that particular day because he was ‘in a fairly calm, diligent mood and reasonably pleased with myself’.⁹ That did not happen very often, at least not on the days he wrote in his diary. Many of the entries are self-reproachful. Despite recurring resolutions, Molewater is not able to get out of bed early, study as planned and stop sleeping with the

⁶ Examples of standard works that neglect medical museums and anatomical collections are Bonner 1995; Ludmerer 1985; Nutton and Porter 1995. On the lack of attention for anatomical museums and collections, see also Reinarz 2005, 149; McLeary 2001, 6–11; Pickstone 2000, 73.

⁷ McLeary 2001; Alberti 2011; Reinarz 2005

⁸ The diary is kept in the city archives in Rotterdam (Dagboekje van J.B. Molewater [Diary of J.B. Molewater], 1833–1835, Rotterdam, Stadsarchief, 328/56); it has also been published (Molewater 1999). On Molewater see also Calkoen 2012, 399–403

⁹ Molewater 1999, 23 (entry 20 August 1833)

mysterious L. J. He was, in other words, a typical student,¹⁰ and his diary might give us an idea of how medical students learned medicine on the days they managed to get out of bed early enough to make it to class.

Molewater arrived in Leiden in June 1830 to study law, but switched to medicine in 1831. This made him one of the 129 students at the medical faculty in 1831.¹¹ Leiden was one of three Dutch universities at the time alongside Groningen and Utrecht. All three had medical faculties, but it is hard to compare the number of students at these faculties given our lack of reliable numbers for Groningen and Utrecht before 1846. From 1845–46, however, the government's estimated number of students per faculty is more or less trustworthy and shows that the total number of medical students between 1845–46 and 1875–76 varied roughly between 200 and 300 (the total number of Dutch students grew from 1214 to 1684 in this period). About half of these students studied in Leiden.¹² After 1876, student numbers went up, but Leiden's share went down after a fourth university was founded in Amsterdam.

All of these students had similar curricula; Molewater took the same classes as students in Groningen and Utrecht. The university curricula were prescribed in detail in the Royal Decree on Higher Education (1815). This law regulated Dutch higher education until 1876, when the Higher Education Act was issued. The decree stated which courses were obligatory, but also what 'material assistance' should be present at the universities.¹³ With respect to medical teaching, it prescribed a collection of medical books in the library, an academic hospital for clinical teaching, a collection of surgical and obstetrical instruments (both contemporary and historical), and collections of anatomical, pathological, physiological and comparative-anatomical preparations.¹⁴

Studying medicine at the university was the only way to become a physician. Surgeons, pharmacists and midwives were trained outside the university as well, but to become a physician, one had to be a *medicinae doctor* – a title that could only be acquired at a university. Until 1865, *medicinae doctors* could start practicing immediately, but that changed under the new medical laws, which required an additional practical exam outside the university. The 1865 medical laws and the subsequent Higher Education Act of 1876 reflected new ideas on how medicine should be taught.¹⁵ In the preceding decades, hands-on experience became more important, as the obligatory practical exam shows. This meant that students spent more time in the dissection hall and the clinic. Furthermore, the

¹⁰ On life as a nineteenth-century student, see Otterspeer 2005, 174–205.

¹¹ Blanken 1869, 115. The total number of students at Leiden University in 1831 was 742. Although it is difficult to determine nineteenth-century student numbers, Blanken is a reasonably reliable source for Leiden University. (Jensma and De Vries 1997, 129–151, 370)

¹² Jensma and De Vries 1997, 188–190, 234. The percentage of medical students in Leiden (as part of all medical students) varied between 40 and 60 percent.

¹³ RDHE 1815, section 'vijfde titel'

¹⁴ RDHE 1815, art. 169, 177, 180

¹⁵ ML 1865; HEA 1876

methods and theories of the natural sciences were beginning to gain importance.¹⁶ The new ‘scientific medicine’ was based on physical and chemical theories; students had to learn these theories and they had to learn them by doing, as was common in the natural sciences. This led to the advent of the teaching laboratory.

None of these changes did away with the need for anatomical teaching collections, in contrast to what has often been suggested in general works on the history of medicine and medical education. If anything, anatomical teaching collections became even more important: more money was invested, new housing was built and the collections grew ever larger; not just in Leiden, but throughout Europe and in the US as well.¹⁷ This may come as some surprise. What role could collections play in hands-on, dynamic teaching environments like the clinic, the dissection hall and the laboratory? Wasn’t their use limited to the static teaching museum? I will demonstrate that collections were part of all medical teaching spaces – not just the museum, but also the lecture hall, the dissection hall, the laboratory and the clinic. We will follow the students through these spaces to see how and why they engaged with anatomical collections.



Figure 1. *The Faliiede Bagijnkerk* (which housed the Anatomical Cabinet until 1860), c. 1600.

¹⁶ Van Lieburg 1995

¹⁷ Alberti 2011; McLeary 2001; Pickstone 2000, 73; Reinartz 2005

Anatomical collections in the museum

The Anatomical Cabinet held the largest anatomical collections in Leiden. It was housed in the Faliede Bagjinker (Church of the Faille-Mantled Beguines) at the Rapenburg. The anatomy department started using the church in 1594, when Pieter Pauw initiated the building of an anatomical theatre in the choir of the church. The front was used by the fencing school, the mathematics school (which offered practical, Dutch-language mathematics classes for engineers) and the university library. In 1644, the English Church began using the part that had once been the fencing school. Preparations were on display in the theatre (only during summer, when no dissections took place), in the hallway and even above the entrance, where two built-in whale bones could be seen.¹⁸ The institution was extended twice in the eighteenth century. The first extension was in 1725, when Albinus was given permission to lecture in what became known as ‘the auditorium’. He had to share it with the school for mathematics and the church council, but it was adapted to his needs with the addition of a small anatomical theatre. The second extension was in 1772, after the university bought Albinus’ private collection from his widow and extra space was needed to house the collection. Anatomy acquired part of the room used by the English Church.

The Cabinet was enlarged once again between 1819 and 1822. The entire ground floor of the church and a newly built extension were now used by the anatomy department. Figure 2 shows the Cabinet as Molewater knew it. It had two lecture rooms (both equipped with an anatomical theatre), a dissection hall, a professor’s room, a room for the prosector and a room for the anatomical collections. The room with the anatomical collections was the largest, measuring 22 metres long by 10 metres wide and 6 metres high. The collections were divided over ten oak-coloured cupboards: one in the middle (13 metres long, 3.25 metres high), eight smaller ones against the long side walls and one custom-made for the Albinus collection against the inner wall that separated the collections room from the dissection hall.¹⁹ The cupboards were separated by a lot of empty space, which allowed people to easily walk through the room and observe the preparations. This suggests that the room was not just intended to store the collections, but also to display them. Indeed, when preparations were placed on the shelves, they were said to be ‘exposed’.²⁰ Thus, the Cabinet contained a museum room: a place where collections were exhibited for one or more audiences.

¹⁸ Witkam 1968, 22

¹⁹ Witkam 1968, 66–67

²⁰ Annual report of the Anatomical Cabinet 1856–57, AC2 271. Other annual reports use similar terms.

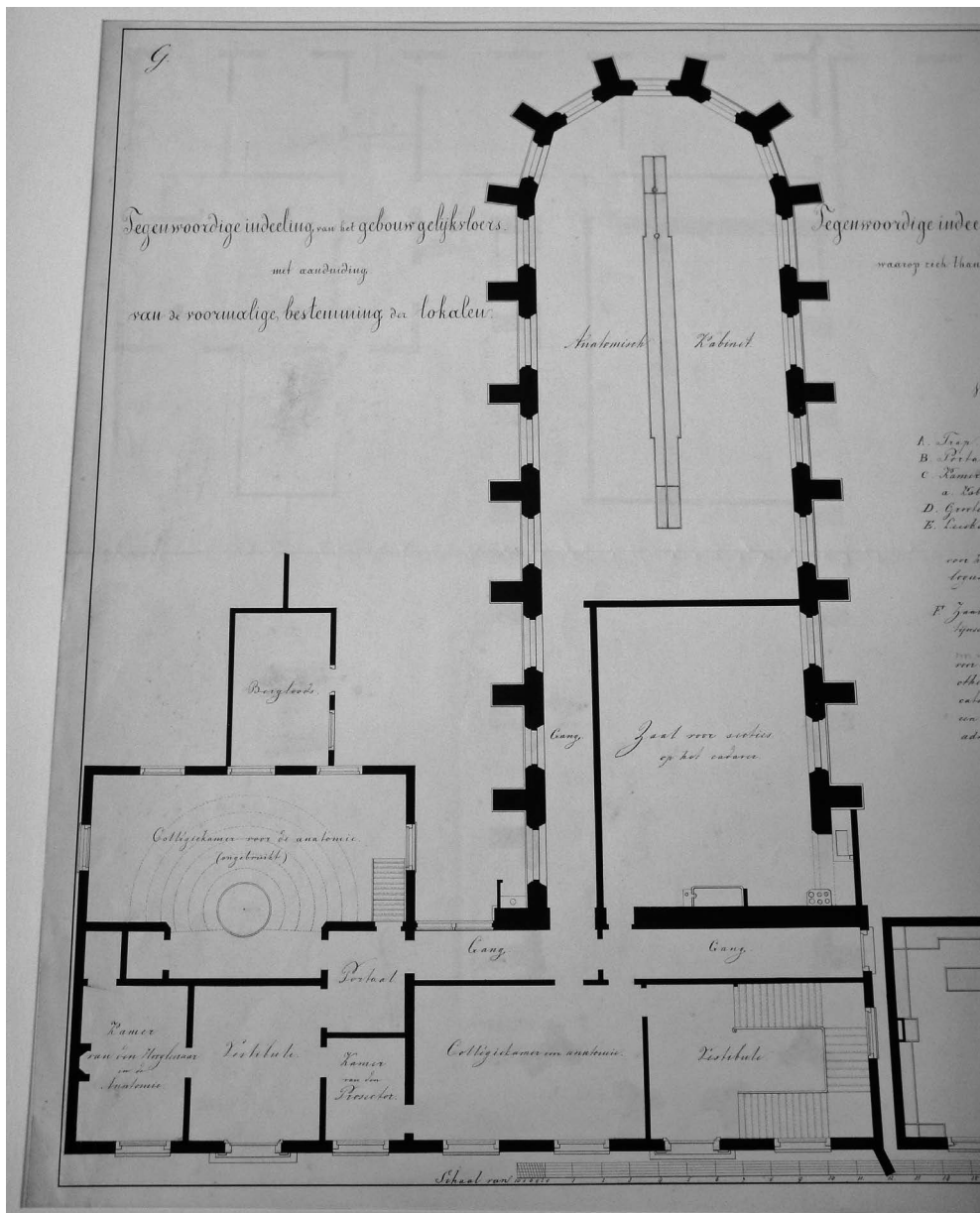


Figure 2. Floor plan of the Anatomical Cabinet after the 1819–1822 renovation. The collection room and the dissection hall are in the old church; the remaining rooms are in the newly built extension.

Students formed one of the intended audiences. They could enter the museum for free. It was one of several museums and collections connected to the university and open to students.²¹ The anatomical museum was most relevant to medical students, but the natural history museum could be of interest as well. Molewater refers to the latter in his diary:

On walks it always bothers me that I am not particularly acquainted and familiar with dear Mother Nature. When I am back in Leiden, I must by all means put some work into an entrance ticket for the museum.²²

‘The museum’ is the National Museum for Natural History, the best museum for discovering Mother Nature. Although the anatomical museum also offered several animal displays, these preparations only included the inside of animals; to study their outsides – most useful on a walk – one had to visit the natural history museum. To do so, Molewater had to, as he writes, ‘put some work into’ an entrance ticket. Students could only gain free entrance by acquiring a ticket from museum staff member J. A. Susanna; they had to visit his home before they could visit the museum.²³ Furthermore, the museum was only open three hours a day, four days a week. By comparison, the anatomical museum was much more accessible. Students could visit the collections every day except Sundays.²⁴ Tickets were unnecessary. Students could simply go to the Cabinet and knock the door, after which the custos would let them in. If the custos was not there, students could find him in his house, next to the Cabinet.

In 1860, the Cabinet moved to a newly built educational complex, which it shared with the physics and chemistry teaching laboratories. After the move, the anatomical collections became much harder to access for lay visitors,²⁵ but students still had few problems getting in. Students had many of their lectures in the new complex, which meant they were taught in the vicinity of the museum. The new arrangement of the collections was hard to interpret for lay visitors, but it was tailored to students, and hence, if anything, the move made the museum *more* accessible to them. Having said this, museum curator Halbertsma did cut down opening hours after the move: students could now visit the museum four instead of six days a week.²⁶ The opening hours of the dissection hall, on the other hand, were extended. Apparently, it became more important that students practiced dissecting and somewhat less important that they visited the anatomical museum. Note, again, that this did not mean that anatomical *collections* lost their importance – they were used outside the museum as well.

²¹ See the student almanacs for a full list. The almanac of 1835, for example, lists the University Library, the Museum of Natural History, the Museum of Antiquities, the Cabinet of Plaster Casts and Prints, the Anatomical Cabinet, the Cabinet of Agriculture, the Hortus Botanicus and the Bibliotheca Thysiana. (LSC [1834], 78–79)

²² Molewater 1999, 45 (entry 15 April 1835)

²³ LSC [1834], 78

²⁴ Opening hours and access guidelines can be found in student almanacs. See for example LSC [1838], 122.

²⁵ Huistra 2010

²⁶ LSC [1859], 66

Other Dutch universities had similar arrangements, although opening times varied: near the end of the century, the collections in Groningen were accessible one hour a week only.²⁷ But students at all universities could visit an anatomical museum by themselves and use its collections to help them study medicine. However, that students *could* visit anatomical museums does not imply they actually *did*. It is unknown whether and how often Leiden students actually studied the museum collections. Molewater does not mention them in his diary. The Cabinet's annual reports, which regularly indicate the use of the collections in lectures, never mention students coming to the museum. And it seems that students were not very fond of the university's museums in general. The student almanac of 1862 states:

As usual, the various museums were hardly ever visited by students, [but] frequently by strangers.²⁸

Unfortunately, we cannot be sure that 'museums' here includes the anatomical museum, because the almanac consequently calls it a 'cabinet', reserving the term museum for other collecting institutions. But this does tell us something about the students' attitude towards voluntary museum visits.

Few sources explicitly state that the students were expected to come at all – an exception is the recommendation of one of the early educational reform committees, the Van Swinden committee, in its 1809 report:

Such a cabinet [a cabinet containing objects useful for courses in anatomy and physiology] needs ... to be open every day on appointed hours, in order for the students in medicine to have free access to it so as to become more familiar with all the parts [of the body].²⁹

The recommendation never made it into official law, but the extensive opening hours published in the student almanacs suggest that professors indeed expected students to visit the museum ('cabinet' in the quotation). What could students gain from these visits? Again, I found very few nineteenth-century Leiden sources that explicitly answer this question. However, research done on medical museums in other countries – where the discourse on the museum's educational use seems to have been more explicit – reveals how the museum may have helped students learn medicine.³⁰

First, studying museum collections was an excellent way to gain knowledge of the human anatomy. Second, the museum not only transferred knowledge, it also trained the scientific eye. In the museum, students learned how to observe. Both goals could also be acquired by other means: students could learn their anatomy by reading books or by taking lectures; and atlases trained the scientific eye just as the museum did.³¹ But the museum had several advantages. For one, the knowledge was displayed through preparations, which were

²⁷ See for the Utrecht collections for example USC [1864], 33; see for Groningen GSC [1884], 45.

²⁸ LSC [1861], 192

²⁹ Van Swinden et al. 1809, 118

³⁰ McLeary 2001, 19–72; Alberti 2011, 164–193

³¹ Daston and Galison 1992

considered more ‘real’ and more attractive to students than drawings. This goes for anatomical preparations demonstrated in lectures as well. However, in the museum, the preparations could be observed as part of a large and ordered system of display; something that was more difficult in the lecture hall.³²

Erin McLeary describes what she calls the ‘museum method’ of learning medicine extensively in her unpublished PhD thesis on US medical museums between 1860 and 1940.³³ She shows how the medical museum was used in education, but she also stresses *that* it was used, and that it remained in widespread use until at least the Second World War – much longer than is often thought. This applies to the Netherlands as well. In the first decades of the twentieth century, several Dutch anatomists published on their institutions’ teaching museums, for example in the journal *Methods and Problems of Medical Education*. They indicate that the museums were intended for self-study by students.³⁴

After the Second World War, medical museums became less prominent in medical education, but they never completely disappeared.³⁵ In Leiden, the present-day anatomical museum is still first and foremost intended as a teaching museum.³⁶ It is housed inside the educational building; the arrangement has been chosen so as to be of the most use to medical students and special audio tours are offered to assist students on their visits. However, that students are welcome and expected does not necessarily imply that they actually come – not now and not in the nineteenth century. But for nineteenth-century students, never visiting the anatomical museum did not mean never engaging with anatomical collections, for students encountered preparations all the time, in almost all of their teaching spaces.

Anatomical collections around town

The Anatomical Cabinet housed the largest anatomical collections in nineteenth-century Leiden, but by no means the only ones. The academic hospital held a pathological anatomy collection. The medical laboratories established in the second half of the century stored preparations as well. The physiology laboratory (founded in 1866) collected microscope slides;³⁷ the pathological anatomy laboratory (1885) received pathological-anatomical preparations from the Cabinet.³⁸ The zootomical laboratory (1876) was not strictly medical, but its comparative-anatomical collection was regularly used in medical teaching. All of these collections were institutional, owned by the university.

³² Carin Berkowitz has argued that preparations in the lecture hall were also part of a visual system of display. (Berkowitz 2012) Berkowitz writes on Britain in the late eighteenth and the early nineteenth century, but it applies to nineteenth-century Leiden (and other places) as well. However, these visual systems of display were much smaller than the museum systems.

³³ McLeary 2001

³⁴ See for example Wijhe 1909; Reddingius 1914; Barge 1925; Van den Broek 1930.

³⁵ See for example Edwards and Edwards 1959; Bozman 1958; and Hackett 1954.

³⁶ Borgonjen 2007, 28

³⁷ Heynsius 1869, 5

³⁸ Annual report of the Anatomical Cabinet 1884–85, AC3 1553

In general, collection ownership shifted from private to institutional in the nineteenth century, but the shift was by no means absolute.³⁹ Institutional collections were known before 1800, certainly in Leiden, where the university had already built a significant collection in the seventeenth century. Nonetheless, in the early modern period, many Leiden professors used their private collections for teaching. The balance shifted after the university acquired the Albinus collection in 1772. In the decades that followed, the Leiden institutional collections expanded rapidly, and university teaching increasingly relied on them. Yet, private collections never completely disappeared.

At least three nineteenth-century Leiden medical professors built a significant personal collection. Jacobus Broers, professor of obstetrics and surgery between 1826 and 1847, owned a collection of pathological preparations. After his death, the preparations were added to the hospital collection.⁴⁰ Gerard Suringar, professor of pathology from 1843 to 1872, also owned a pathology collection. In 1866, he donated over 800 of his preparations to the university.⁴¹ The governors expressed their gratitude with an inscribed silver vase and the preparations were added to the Anatomical Cabinet.⁴² Both Suringar and Broers probably stored their preparations at home. This is less clear with Hidde Halbertsma, professor of anatomy and physiology between 1848 and 1865. He built a private collection in the first years of his professorship,⁴³ but this collection may very well have been housed in the Anatomical Cabinet, of which Halbertsma was the curator.

Some students probably also owned small anatomical collections. Figure 3 is a drawing by Alexander Verhuell (the author of this chapter's opening story). The drawing, made for the student almanac, is titled 'Het gevaar van een medicus op kamers te hebben' ['The danger of having a medical student in lodgings'].⁴⁴ We see a shocked landlady who discovers that the student is dissecting a human leg under her roof. The landlady enters his room carrying a tray with a bottle that seems to contain alcohol, probably at the student's request – although she may have misinterpreted his reasons. It is surprising that she had not caught him before, considering the collection of preparations already present on top of his cupboard. Another drawing by Verhuell entitled 'Een medicus die stil geniet' ['A medical student who quietly enjoys himself'], shows a similar image, minus the landlady and with a more central collection of preparations (figure 4).⁴⁵ Both drawings are satirical, so we cannot take them as conclusive proof, but at least they indicate that stories circulated on medical students making and storing preparations in their rooms.

³⁹ See Alberti 2005b on collection ownership in the UK.

⁴⁰ Annual report of the Anatomical Cabinet 1850–51, AC2 270

⁴¹ The preparations are described in Suringar 1866a.

⁴² *Leydsche Courant* 1867

⁴³ Halbertsma to governors 14 March 1852, AC2 116, 59

⁴⁴ Verhuell 1882, plate 29

⁴⁵ First appeared in Verhuell 1847b.

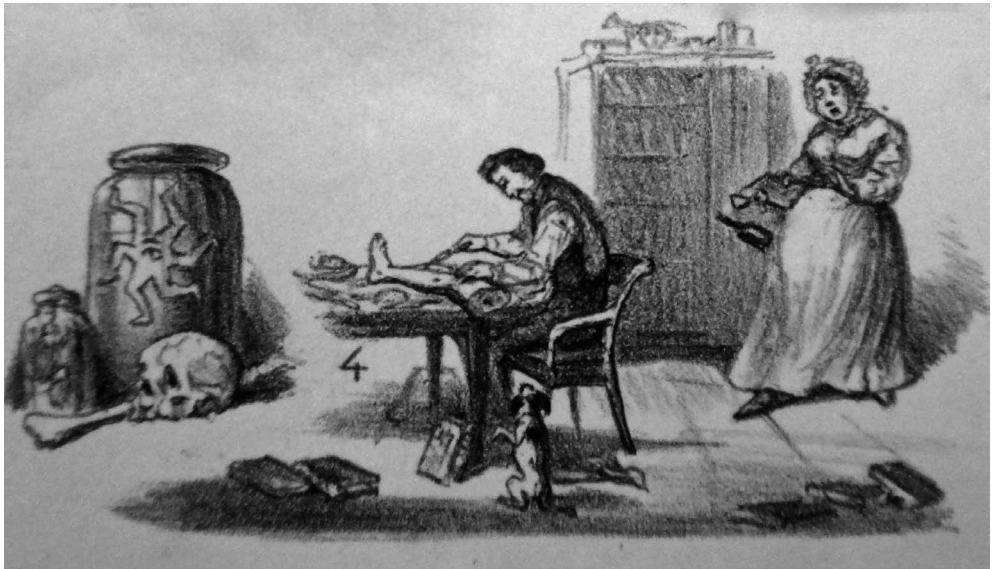


Figure 3. 'The danger of having a medical student in lodgings', by Alexander Verhuell.

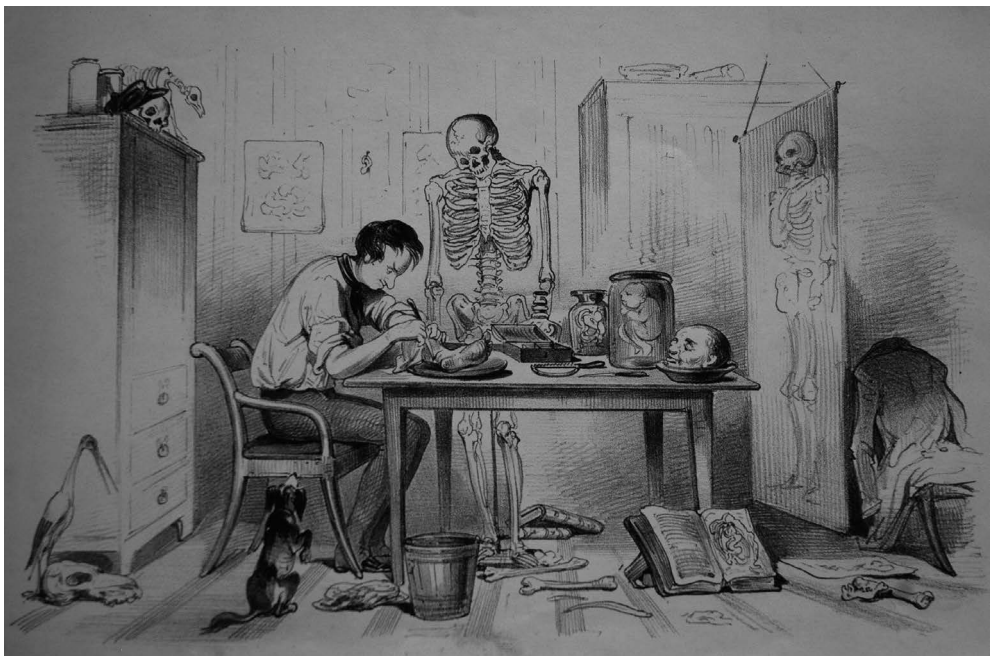


Figure 4. 'A medical student who quietly enjoys himself', by Alexander Verhuell.

What is more, anatomy handbooks regularly recommended that students build their own collections. Take, for example, the handbook that Molewater used: Georg Hildebrandt's *Handbuch der Anatomie des Menschen*.⁴⁶ Molewater used the fourth edition (1830–1832), which had been heavily edited by German anatomist Ernst Heinrich Weber. In his preface, Weber advises students on how to study anatomy. One of his recommendations:

Every student must try to provide himself with the bones of the human body, even if they are to be collected from graveyards.⁴⁷

Other handbooks that recommend collections are less explicit about where students should obtain their preparations, but almost all of them state that bones – or a complete skeleton, if possible – should be the first thing students acquire. This is probably because bone preparations were relatively easy and cheap to preserve, since they required neither glass nor alcohol. Students could then extend their collections with wet preparations, if possible. Some authors explicitly recommend this; others, like Weber, do not.⁴⁸

We do not know whether Molewater indeed owned a collection, but we do know that he dissected at home. This practice was not new in the nineteenth century; students in the early modern period did so as well.⁴⁹ From Molewater's diary it seems that students could easily acquire animals for dissecting. Molewater's first attempt at practicing 'anatomizing' failed: 'I have received my calf's eye, but unfortunately I lack good scalpels.'⁵⁰ But only two days later he tells us how he dissected a tortoise together with his friend Karel Giltay.⁵¹ Giltay, who at that time had just finished his medical studies, handled the knife more often: a few days earlier he showed Molewater the internal organs of a two-headed goat.⁵² It is possible that Molewater and Giltay kept preparations of the organs after these dissections.

A university town like Leiden housed dozens of collections, both private and institutional. Most of these were *not* museum collections like the one in the Leiden Anatomical Cabinet. The collections in the hospital, the laboratories and professor's houses were not for display. Rather, these were handling collections.

Collections for display, collections for handling

In 1909, anatomy professor Jan Willem van Wijhe spoke at the opening of his new anatomical laboratory at the University of Groningen. He told his audience:

⁴⁶ Molewater mentions the book in his diary: Molewater 1999, 45 (entry 15 April 1835), 47 (entry 16 April 1835).

⁴⁷ Hildebrandt 1830, xi

⁴⁸ For handbooks that do suggest students should make and keep wet preparations, see Hunter 1784, 110; South 1825, xix; Hyrtl 1865, 40, 577.

⁴⁹ Some students from the early modern period also built their own collections. The later Utrecht professor Jan Bleuland (1756–1813), for example, started his famous comparative anatomy collection in the first year of his studies in Leiden. (Van der Knaap [2001], 13)

⁵⁰ Molewater 1999, 50 (entry 17 April 1835)

⁵¹ Molewater 1999, 52 (entry 19 April 1835)

⁵² Molewater 1999, 48 (entry 16 April 1835)

In an anatomy laboratory there are at least two collections of preparations, i.e. the one exposed in the museum and the lecture collection. The preparations from the lecture collection are used regularly and are often taken out of the jars, from which their appearance, of course, suffers, and so they are not suitable to be exposed.⁵³

Van Wijhe's laboratory was new, but his distinction between collections was not – it was a common distinction throughout the nineteenth century. We also find it, for example, in Joseph Hyrtl's *Handbuch der praktischen Zergliederungskunst* ('Handbook of Practical Anatomy', 1860). The *Handbuch* was translated into Dutch by the Utrecht professor Jacobus Schroeder van der Kolk and the Leiden prosectors (and later professors) Johannes Boogaard and Teunis Zaaijer. From the introduction:

Preparations, kept in spirits of wine, yet taken out of this for demonstration so as to look at them more carefully, usually are not part of the showpieces in anatomical museums, but are kept in the side rooms of laboratories, so-called 'hand museums'; these contain objects which are used often and are subject to a certain change.⁵⁴

Hyrtl called them 'hand museums'; Van Wijhe, 'lecture collections'. The terms 'tank specimens' and 'store preparations' were also used.⁵⁵ Whatever they were called, these collections and preparations were intended to be *handled* – as opposed to collections that were intended to be *displayed*. And this handling, as Van Wijhe and Hyrtl indicate, usually involved taking the preparations out of their jars.

Since handling preparations were meant to be removed from their jars, they required different preparation techniques than display preparations. For one thing, they had to be robust enough to be handled. Corrosion casts, for instance, were rarely used in handling collections. To make a corrosion cast, the vessels are first injected and the preparation is then soaked in chemicals that slowly destroy the flesh. The resulting cast shows the vessel system in great detail, but is also very fragile – too fragile to be touched. However, no nineteenth-century technique resulted in preparations so robust that they could be handled for years on end (as is the case nowadays with plastinates). Preparations in handling collections therefore had to be replaced regularly, which is why Hyrtl described the hand museums as 'subject to a certain change'. But although damage was unavoidable in the end, some techniques could withstand more handling than others, and these were preferred for handling collections.

The main technical difference between handling and display preparations, however, was not found in the techniques used to dissect and preserve the tissue, but in the techniques

⁵³ Wijhe 1909, 14–15

⁵⁴ Hyrtl 1865, 30

⁵⁵ 'Tank' (or 'hand') specimens was used in medical museums in the US, see McLeary 2001, 38n36, 95–96, 196; 'store preparations' (or 'store specimens') was used at the Royal College of Surgeons in London, see for example William Clift, 'Memoranda concerning the sale of old and duplicate specimens of Natural History and Anatomical Articles by the British Museum to the Royal College of Surgeons in London, in the Year 1809', May 1835, RCSE MS0007/1/2/2, 11; and the annual report of the conservator to museum committee 1876–77, 2 July 1877, RCSE RCS-MUS/8/2/1.

used to close the container holding the tissue. The closing technique has to slow down evaporation of the preserving fluid as much as possible. The best way to do this is to seal the lid, preferably airtight. Materials used for sealing included pig's or bullock's bladder, wax, lead and tin foils. But these sealing techniques cannot be used in handling collections: when a jar is sealed, it is too cumbersome to open it and remove the preparation. It is possible, and it was done sometimes (more often for research than for teaching), but it took a lot of time and effort. Therefore, handling collections used different closing techniques, which rendered the jar not only as airtight as possible, but also easy to open, close, and open again. Hyrtl, for instance, used stoppered bottles.⁵⁶

Hyrtl wasn't the only one who used stoppered bottles. Diaries and reports from curators and students at the Royal College of Surgeons in London (RCS) reveal that stoppered bottles were regularly bought and used at the College as well.⁵⁷ One needs to look at archival material to discover this; although many nineteenth-century preparations are still part of the College's collections, the ratio of sealed to stoppered bottles is misleading. The vast majority of the remaining preparations are mounted in sealed jars, suggesting that the nineteenth-century collections were largely display collections. This is not true, as follows from references to stoppered bottles in the diaries (and even more so from the explicit remarks on handling preparations that can also be found in the archival material, which will be discussed in greater detail in the chapter on researchers). It only appears that way because the stoppered bottles were less likely to survive over time than the sealed ones. This applies not just to the RCS collections, but to most anatomical collections. This has two reasons. First, because they were not as airtight as sealed bottles, the fluid evaporated more quickly, which made the preparations more prone to decay. And second, handling collections were not intended to be kept forever: they were used, touched, handled, or even cut up – all practices that shortened their lives considerably. But if you look closely at the nineteenth-century collections that still exist, both at the RCS and elsewhere, you will find some remaining stoppered bottles in all of them. Ironically, they turn out to be the hardest to open nowadays, making it difficult to top them up. The problem is probably that part of the preparation has dissolved in the fluid, and when that fluid evaporates, the tissue sticks between stopper and bottle: it becomes 'human glue', according to the present-day head of the RCS conservation unit.⁵⁸

⁵⁶ For larger preparations, he suggests glass vessels with removable lids. (Hyrtl 1865, 30)

⁵⁷ See for example Diary William Clift 1838, RCSE MS0007/1/4/2/29, 3 May, 5, 17, 31 October, 8 December 1838; Diary William Clift 1839, RCSE MS0007/1/4/2/30, 24 June 1839; Quekett Diaries, 1840–1848, RCSE MS0027, 28 February, 30, 31 July, 1 August 1845; Student Diary Henry Carter, 1853–55, RCSE MS0134, 12th week (1853).

⁵⁸ Cooke 2011

In addition to stoppered bottles, screw-top bottles were also used – in storerooms one sometimes encounters preparations in recycled pickle jars, with labels still present.⁵⁹ We can see examples of both in the Leiden collections, and we know from the collection reports that a third storage method was used as well. In his 1851–52 annual report, curator Halbertsma complained that the large vessel and nerve preparations (which did not fit in glass bottles) were stored in wooden containers, while tight-closing tin tanks would lead to a smaller loss of spirits and hence lower costs.⁶⁰ Metal or wooden containers were of course useless for display collections: neither tin nor wood is transparent, which is quite inconvenient if you want to look at the preparations from a distance. For handling preparations, on the other hand, these chests and boxes are convenient. They were cheaper than glass, less fragile, and they could be acquired in much larger sizes. This was useful for storing large preparations, but also for storing multiple preparations together, thereby saving expensive preparation fluid.

The Leiden collection reports never explicitly stated that preparations shared a container, but we know it was common in other places. The RCS storeroom catalogues, for instance, list jars with multiple preparations on almost every page.⁶¹ Another example can be found in the travel diary of the Utrecht student Christiaan Tilanus. In 1820, he visited the anatomical collection in Heidelberg together with his fellow students Peter de Fremery and Jacob Broers (who would later become a professor of obstetrics and surgery in Leiden). Tilanus wrote:

That this collection is constructed not only as a collection, but also to provide a significant number of objects for teaching is proven by the nerve preparations which Mr Tiedemann demonstrated to us. These preparations were perfectly made and contained the nerves of the upper and lower limbs and those of the larger cavities. All nerves were clearly visible in their mutual relations to the neighbouring parts, blood vessels, muscles, etc; all of these preparations were stored in a large chest fitted with tin on the inside, with wine-spirit, in which they all were soaked, and even the upper ones could never decay in this habitus.⁶²

Tilanus distinguishes between two types of preparations: those intended to be part of the collection (the display collection), and those intended for educational use (the handling collection). The ones intended for educational use were stored in wood, not glass, and in several layers. To use them, the wooden box had to be opened and the preparations removed in order to be studied (and handled).

All of these closing techniques – stoppers, screw-tops and boxes – made it easy to remove the preparations from their containers on a regular basis. The next question is: what

⁵⁹ See for example Lynn Morgan's description of an embryo collection in a storeroom at Mount Holyoke College (South Hadley, Massachusetts); Morgan encountered not only reused mayonnaise jars but also '[a] jar that had once contained eight pounds of Kraft fresh-chilled grapefruit sections [and] now was packed with eight topsy-turvy fetuses in various states of deterioration'. (Morgan 2009, 1)

⁶⁰ Annual report of the Anatomical Cabinet 1851–52, AC2 270

⁶¹ See, for example, Hillman 1841a and Hillman 1841b.

⁶² Deelman 1920, 65

happened to the preparations after they were taken out? How, why, when and where were they handled?

Active observation in the lecture hall

Molewater regularly missed lectures; as we know, getting up in time was not one of his qualities. On 13 October 1834, for example, he writes, ‘Gotten up too late to go to Sandifort.’⁶³ Gerard Sandifort was his anatomy professor. When Molewater skipped his lectures, he not only missed Sandifort’s dictation, but also an opportunity to handle preparations. Preparations were a standard pedagogical tool in medical lectures, as illustrated by this quotation from one of Sandifort’s collection reports:

[The collection of the *Museum Anatomicum*] is being employed daily in giving lectures both on anatomy and physiology of Man in healthy and diseased condition, as well as on comparing Man and the Animals, so young students enjoy all its uses.⁶⁴

Sandifort’s remark demonstrates that he was not the only professor using preparations. Professors teaching pathology and comparative anatomy also employed them. Other primary sources reveal that preparations were frequently and widely used in lectures. For instance, the obituaries of Leiden professors Halbertsma and Zaaier praised the way they used preparations to illustrate their lectures.⁶⁵ Another example is comparative anatomy professor Jan van der Hoeven, who wrote:

In my ... lectures on comparative anatomy, I constantly used preparations from the Anatomical Cabinet, which then had to be transported to my lecture room at my request.⁶⁶

Van der Hoeven referred to the collections housed in the Anatomical Cabinet. These are also the collections Sandifort alluded to in the quotation from his collection report. I discussed the Cabinet’s collections above as museum collections (collections intended for display), but they were more than that alone: they also doubled as handling collections. The cupboards containing the collections opened easily.⁶⁷ When needed during lectures, the preparations were simply taken off the shelves and transported to the lecture rooms down the hall. (In the early twentieth-century pathology laboratory, a special elevator was installed to transport preparations from the laboratory’s museum to the lecture room.)⁶⁸ The Cabinet collection, of course, was not the only handling collection. When lectures took place in the

⁶³ Molewater 1999, 44 (entry 13 October 1834)

⁶⁴ Annual report of the Anatomical Cabinet 1835–36, AC2 270. Teaching use is mentioned almost every year in Sandifort’s annual reports on the Cabinet.

⁶⁵ Koster 1866, 43; Quant 1903, 1; Daniëls 1902–03, 172

⁶⁶ Van der Hoeven to governors, 6 January 1859, AC2 127, 5

⁶⁷ Witkam 1968, 67

⁶⁸ Annual report of the pathological-anatomical laboratory 1904–05, AC3 1560

university hospital, the collection housed there was used instead.⁶⁹ Sometimes professors used their own preparations in class, if the Cabinet did not offer what they needed.

After arriving in the lecture hall, preparations were often removed from their jars and passed around (sometimes preparations were displayed on a table in the front, so the students could study them afterwards). It was commonly felt that out of their jars, preparations best helped students to learn about the body.

The first reason for this was that it was easier to observe the preparations outside their containers. Students could get a close look at them and the view was not distorted by the glass or the fluid. Hyrtl writes:

When one takes preparations out of the spirit, one can examine them more closely than is possible in the jar, where one thing is covered by another.⁷⁰

In this particular quotation, Hyrtl deals with nerve preparations.⁷¹ When a nerve preparation hangs suspended in a jar it is impossible to get a good view of all the nerves due to the multiple layers of tissue. However, when the preparation is taken out of the jar, you can look at it from all sides and angles and, using your fingers or a pair of tweezers, pull away the upper nerves to get a good look at the ones below.

Getting a closer look was not the only advantage of taking the preparations out of their containers. It also allowed students to use more senses – not only sight, but also touch and smell. This was an advantage because it allowed them to observe more phenomena, but also because it was thought that using more senses made it easier to remember what was learned. Furthermore, it allowed students to train all of these senses – an important aspect of the practical teaching methods that became more important as the century progressed.

Handling preparations outside their jars had one major disadvantage: the preparations inevitably became damaged. The techniques used were meant to withstand touching, but none of them could do so forever. Especially not when the audience included students like the ones Scottish anatomist Robert Knox encountered:

So far as my own observations go, I am quite certain that few preparations can be entrusted into the hands of students.⁷²

Because of his experiences, Knox hesitated to let students handle his preparations, although he hoped that his book would help them see the error of their ways:

A knowledge of this [preparation techniques explained in the remainder of the book], instead of it apparently giving pleasure to many to twist off a toe or finger [of (part of a) skeleton], will

⁶⁹ Annual report of the medical faculty 1850–51, Nosocomium, AC2 270; Annual report of the academic hospital 1859–60, AC2 271

⁷⁰ Hyrtl 1865, 430

⁷¹ Hyrtl was not the only author who pointed out that nerve preparations had to be examined outside their jars, see for example Lauth 1839, 510.

⁷² Knox 1836, 3

give them real pain from perceiving that they have seriously and permanently injured an anatomical preparation.⁷³

The Leiden archives make no mention of students intentionally destroying preparations, but damage occurred nonetheless. The 1892–93 report of the Leiden pathological anatomy lab reads:

From time to time, pathological-anatomical preparations kept in spirits become unusable, sometimes because the spirits destroy the characteristics of preparations, but also when the preparations are used for teaching almost 200 students. Every suitable opportunity was used to replace these unusable preparations with new ones.⁷⁴

The writers of the report, unlike Knox, did not blame students in the least for spoiling the preparations. It was simply seen as daily wear and tear, and the simple solution was to replace the damaged ones with new preparations. Hyrtl's textbook also displays this unconcerned attitude. Hyrtl considered the damage and loss of preparations due to handling unavoidable and recommended building a substitute collection for the most fragile preparations:

I am in the habit of stocking up duplicate copies of all ligament preparations; of everything that relates to elucidating important parts of the theory of the senses, of the theory of the intestines, and of the nerves.⁷⁵

For many nineteenth-century anatomy teachers, the advantages of handling preparations outweighed the disadvantages. Handling was a natural part of practical teaching; passing preparations around for students to touch and handle forced them to use – and thereby train – as many of their senses as possible. Viewing the preparations from a distance could never achieve the same goal.

Of course, handling preparations was not the only method used in practical teaching. Dissecting was another one. Students were increasingly stimulated and expected to dissect by themselves. After Halbertsma extended the opening hours of the dissection hall in 1849, students could practice every day instead of a few hours a week – an opportunity they gratefully seized.⁷⁶ But the increased opportunity for dissecting did not imply a decrease in handling preparations. Figure 5 illustrates the continued importance of preparations in teaching. The photograph dates from the end of the nineteenth century and shows anatomy professor Zaaiker giving a lecture – or posing as if he is. He is surrounded by teaching tools including, at the left side of the table, preparations ready to be handled.

⁷³ Knox 1836, 3

⁷⁴ Annual report of the pathological anatomy laboratory 1892–1893, AC3 1556

⁷⁵ Hyrtl 1865, 30

⁷⁶ LSC [1849], 108

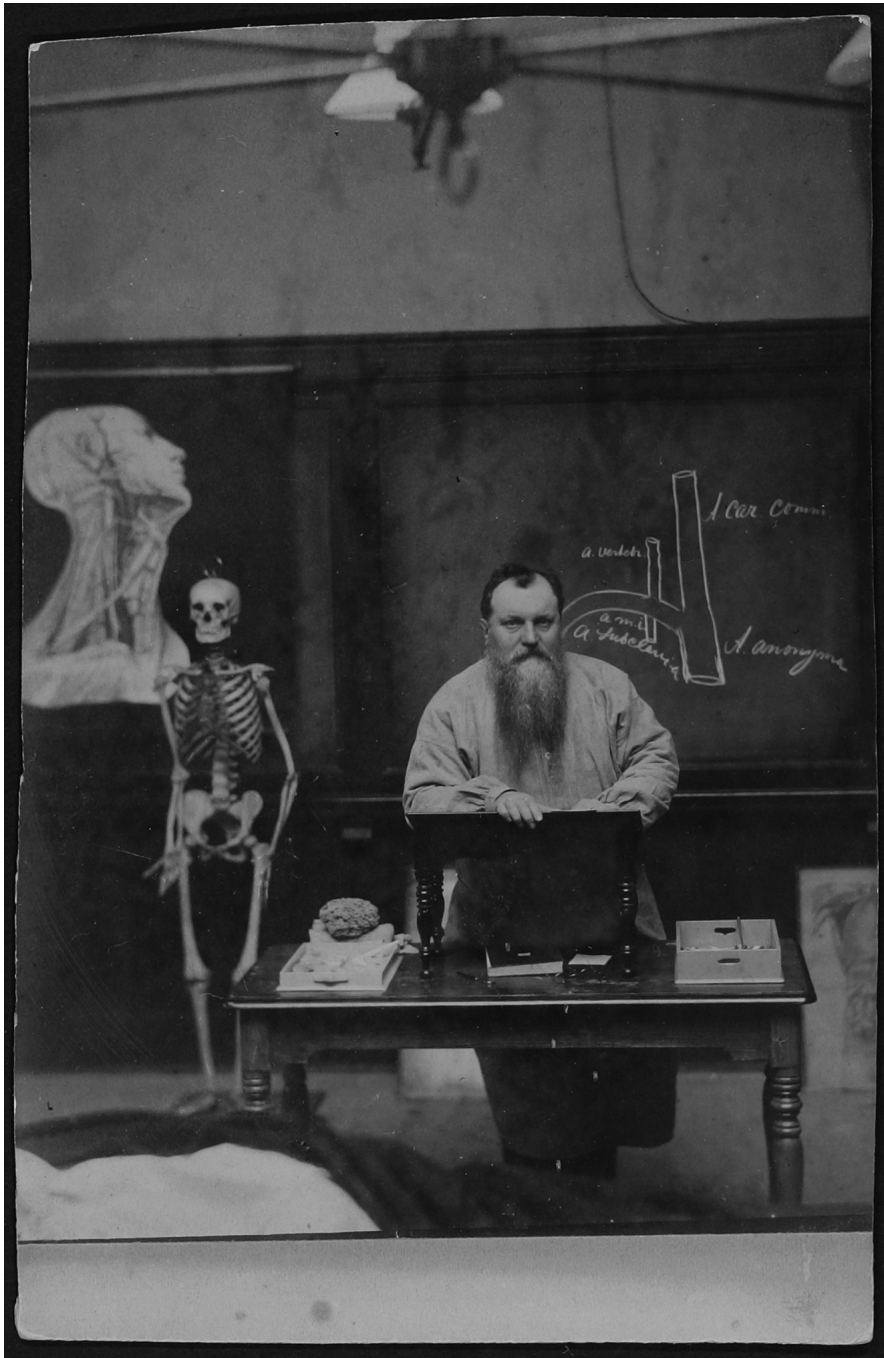


Figure 5. Professor Zaaier in the lecture hall, surrounded by teaching aids – including, on the table, preparations.

Observing preparations as closely and with as many senses as possible did not become redundant when students dissected more often. On the contrary, preparations remained essential to learn about the body for several reasons. First of all, students needed to have at least some knowledge about the body before they entered the dissection hall. Corpses were too valuable for students to be cutting into them without any prior knowledge. They had to have at least some idea of what they were doing, where they had to cut, and what they were supposed to see inside the body. Opinions varied on how much prior knowledge students needed before starting to dissect.⁷⁷ Hyrtl advised to commence cutting as soon as possible when learning general anatomy; but he made sure that he always discussed the theory *before* students observed parts in the corpse.⁷⁸ Students had to wait longer in the pathological anatomy classes in Leiden: in their first year, they were given a general overview with the help of preparations; it was not until the higher years that they learned through dissection.⁷⁹

Used in this way, preparations prepared students for dissecting. But they could also supplement the learning done at the dissection table. Preparations displayed knowledge about the body that could not be transmitted through a dissected corpse. For example, students used pathological preparations to learn about diseases and malformations; the limited supply of bodies made it unlikely that students observed more than a few pathological conditions during their dissections.

Nowadays, preparations are still used in this way, especially in training specialists. Tropical medicine is an example. Pelvic malformations caused by rachitis, osteological tuberculosis and polio regularly occur in third world countries, but are completely absent in the Western hospitals where tropical medicine is taught. So, for instance in Groningen, tropical doctors in training practice delivering babies using nineteenth-century preparations of pelvic malformations.⁸⁰

Furthermore, preparations were used to demonstrate peculiar characteristics that were not *visible* during dissection. Hyrtl refers to this when he writes:

Instructive lectures on the anatomy of the heart can only be given with the help of preparations in which all details that cannot be observed properly in fresh hearts have been clearly revealed.⁸¹

Small vessels are an example of anatomy invisible to the naked eye. To observe them properly, one has to make injection preparations.⁸² In an injection preparation, the previously emptied vessels are injected with a fluid foreign to the body. Many different recipes for injection fluid were used in the nineteenth century, but all of them had the same purpose: to make even the smallest vessels visible to the naked eye. The fluid solidified after

⁷⁷ Buklijas 2005, 108

⁷⁸ Hyrtl 1865, 10–11

⁷⁹ Annual report of the Anatomical Cabinet 1872–73, AC2 273

⁸⁰ Erkelens 2006, 42

⁸¹ Hyrtl 1865, 270

⁸² See for example Voorhelm Schneevogt 1847, 315 – note that Schneevogt stresses that students have to have an image of the ‘natural state’ (i.e., the anatomy of the fresh body) before they start working with injection preparations. This prevents them from getting the wrong ideas on what is and is not visible in the body itself.

injection and filled the vessels, making them larger, and hence easier to observe. Of course, the small vessels could also be seen through a microscope, but a microscope only shows a small part of the whole at a time, making it hard to get an overview of the relationship and connections between the different vessels. Injection preparations were the preferred method of providing a complete picture.⁸³ Students also injected vessels during dissection, but this required a considerable amount of time and skill. Therefore, students generally used injection preparations to investigate the build-up of the body's vessels.

These three reasons – students needed to be prepared, the available bodies did not show everything (in particular, not all pathologies) that students were required to learn, and some things could not be seen in a freshly dissected corpse – explain why dissecting alone did not suffice when studying anatomy. Handling preparations was essential. But the reverse was also true: handling preparations was necessary but not sufficient – it needed to be complemented with dissecting. To become good doctors, students needed to visit the dissection hall as well as the lecture room; and working in the dissection hall required engaging with anatomical preparations, as we will see in the next section.

Making preparations in the dissection hall

In the lecture room, students handled preparations in the simplest way: touching them without altering them. In the dissection hall, they did something more complex: they *made* anatomical preparations. Dissecting a body and creating a preparation were closely connected. Take the following remark from the medical faculty's 1850–51 annual report:

Concerning the material subsidies for the teaching of anatomy and physiology Professor Halbertsma remarked that the number of bodies at his disposal for the practical training in anatomy, although anything but big, was sufficient for the meagre number of students that participated. This outcome would, however, not have been possible, had some students not concentrated on making delicate vein and nerve preparations, on which, on account of preserving them in spirits, they could work for a reasonably long time.⁸⁴

Apparently, students made their own preparations in the dissection hall – and they could work on them for prolonged periods. The close connection between dissecting and making preparations also follows from practical anatomy handbooks: often student dissection manuals included guidelines on making (and keeping) preparations.⁸⁵

Dissecting sometimes involved a complete body, but more often it meant working with individual body parts. These were easier to distribute among students and easier to store in between sessions. They were also easier to acquire. Bodies were never abundant, something that became painfully clear to Molewater when he wanted to take the exam for surgical

⁸³ Zaaijer 1866, 22–23

⁸⁴ Annual report of the medical faculty 1850–51, AC2 270

⁸⁵ See for example Hildebrandt 1830–1832; Hyrtl 1865; see also Hyrtl's summaries of the best-known anatomy handbooks, Hyrtl 1865, 40–49.

doctor in 1851. Molewater had graduated as a *doctor medicinae* in 1840, but when he applied for a job as hospital director he was asked to become a *doctor chirurgiae* as well. This required no additional courses, but a practical session was part of the exam, and Molewater had to bring his own corpse. Apparently, he had trouble finding one and wrote to the Leiden surgical professor F. W. Krieger (1805–1881) for help. Krieger replied:

People in Leiden are just as unwilling to go *ad patres* for the benefit of a surgical exam as people in Rotterdam, Americans, &c. are, in other words, we do not have a cadaver available either. ... If you have the opportunity to acquire a cadaver, or part of it, in the meantime [i.e. before the exam], bring it hither; apropos! Would [doctor] Schneevoigt not be able to help you? What if you wrote him that you need a lower limb for your surgical exam, and asked him to send such a *pars cadaveris* to the local anatomy hall before Tuesday?⁸⁶

Krieger suggested that Molewater ask for a leg if he was unable to find a complete body, which suggests that limbs were easier to come by than whole corpses. This is not surprising. Most bodies have two arms and two legs, but only one abdomen. Hence, if a body is used for a demonstration, in all likelihood at least one arm and one leg will be left over. Furthermore, arms and legs could be taken not only from the dead, but also from the living: amputated limbs probably ended up in the dissection hall. This is at least suggested by the lists of available bodies: more than once, they referred to both full bodies and some additional limbs that had been acquired.⁸⁷

Students could be working on a single part for weeks on end. In between sessions, the unfinished preparations had to be stored so that the tissue neither decayed nor became too fixated to work with. Hyrtl advised to keep the objects in fresh water as long as possible, and eventually replace the water with an alcohol solution.⁸⁸ Zinc tanks were considered the best containers. Preferably, these had ledges that could support a draining grid, because:

Every practised anatomist knows from experience how inefficient and unpleasant it is to transfer still dripping preparations to the dissection table which soon becomes a quagmire; and how much alcohol gets lost in the process.⁸⁹

Furthermore, students had to be protective of the body parts they were working with. In 1861, London student Shephard Taylor wrote in his diary:

Nearly lost my part, an unscrupulous individual having temporarily appropriated it in consequence of there being no card attached to it.⁹⁰

Finished student preparations were sometimes added to university collections. In Vienna, Hyrtl selected the most beautiful ones and displayed them with their makers'

⁸⁶ Krieger to Molewater, 13 December 1851, Rotterdam, Stadsarchief, 328/51

⁸⁷ See for example annual report of the medical faculty (teaching) 1858–59, AC2 271; annual report of the Anatomical Cabinet 1862–63, AC2 271; annual report 1876–77, AC2 273.

⁸⁸ Hyrtl 1865, 27–29

⁸⁹ Hyrtl 1865, 29

⁹⁰ Taylor 1927, 23 (entry 24 January 1861); see also Taylor 1927, 21 (entry 15 January 1861) and Taylor 1927, 24 (entry 1 February 1861).

names, so as to inspire other students.⁹¹ Pieter Harting, who studied in Utrecht in the 1820s, recalled in his memoirs how some student preparations were added to the university collections – the ones for which the students had taken an extraordinary amount of time and care.⁹² Finished preparations may also have been taken home by students. I have not found explicit references to this for Leiden, but it happened in other places. Taylor even described in his diary how a competition for interesting body parts took place in the London dissection hall he worked in:

Some individuals seeming to take an interest in Cross' and my specimen of left carotid artery coming off from the innominate artery, we thought proper to anticipate their kind intentions by removing it ourselves to a place of safety. We therefore tossed up for it, when, as usual, I was on the unlucky side, and Cross carried off the prize.⁹³

Students made preparations for various reasons. In their early years, it was a way to learn anatomy and to practice their dissection technique. At the end of their studies, it could be part of their dissertation research; the preparations were then needed to answer particular research questions. In the course of the century, microscopic preparations were increasingly in demand. A typical example of the way students worked with microscopic preparations can be found in the dissertation of the Leiden student Johannes Niermeyer. Niermeyer was a student of Theodorus MacGillavry, pathology professor from 1888 to 1905. In his neuropathological dissertation Niermeyer examined the nervous system of a tetanic rabbit. He referred to other anatomists who had explained the difficulties of discovering tetanus on fresh coupes, and he discussed in great detail how he created microscopic preparations as part of his research.⁹⁴

Whatever the preparations were intended for, students could not make them without 'raw material'. Preparations required bodies. One of the key suppliers of these bodies was a space students visited regularly: the academic hospital.

The academic hospital

Medical teaching was founded on bodies. Without bodies, anatomical demonstrations, student dissections, post-mortems in pathology classes, demonstrating and practicing surgical procedures and building anatomical teaching collections could not take place. Professors regularly complained about a lack of bodies. Take, for example, the following quotation from the 1852–53 annual report, which contains not just a complaint, but also a possible solution:

This year, 14 bodies were available for anatomical demonstrations and the students' practical anatomy training. Although this number was slightly larger than last year, it can still be called

⁹¹ Hyrtl 1865, 40

⁹² Harting 1878, 31

⁹³ Taylor 1927, 78 (entry 29 January 1862)

⁹⁴ Niermeyer 1879

small because of the larger demand that existed due to the increased number of students, and it is to be hoped, also for the teaching of anatomy, that the establishment of a city hospital will lead to some improvement.⁹⁵

Apparently, more hospital beds were desirable because they would lead to more deceased patients, and hence, more bodies for teaching. This does not mean that every deceased patient was dissected; permission had to be sought from the family of the deceased, as was established by law in 1869, and seems to have been common practice long before that.⁹⁶ The hospital was not the only source of bodies: Leiden made, or tried to make, arrangements with various prisons as well.⁹⁷ All in all, some ten to twenty bodies became available for anatomical dissections in Leiden each year.⁹⁸ Ten times this amount was available for post-mortem examinations.⁹⁹ During a post-mortem, the body was not completely dissected, but cut open to the extent necessary to establish the cause of death. Usually the prosector or professor handled the knife, but sometimes students were allowed to as well.¹⁰⁰ If the relatives of the deceased gave permission, the diseased organ or tissue was removed from the body, after which it was turned into a preparation for the university collections.¹⁰¹

The hospital was an important source for the Leiden anatomical collections. Hospital bodies varied more than prison bodies: the hospital offered both genders, all ages, and a wide range of pathologies, while the prison supplied mainly men of the crime-committing age. Hence, preparations made using hospital cadavers were more likely to fill a gap in the collection. In other words: when students followed their professor on hospital rounds they were looking not only at patients, but also at possible dissection material. Students realized this, as Molewater's diary shows:

This morning, I visited the practical classes, including surgery, for the first time [this academic year] and I saw all kinds of miseries. Among other things, a *pièce de caractère* in which man cut an insignificant figure. A very poor woman lying in bed with two small children, twins, to whom she recently gave birth, both barely 1 foot long, and whose little cadavers had already been promised to young men by [pathology professor] Broers, in order to be put in spirits. Meanwhile, these moral creatures were still alive, and the mother heard without any sorrow that they would die because she could not provide for them anyway.¹⁰²

⁹⁵ Annual report on the teaching in the medical faculty 1852–53, AC2 270, B.I.a.

⁹⁶ BA 1869, art. 1; Verwaal 2010, 23–24

⁹⁷ See for example annual report of the Anatomical Cabinet 1862–63, AC2 271; annual report of the Anatomical Cabinet 1866–67, AC2 272.

⁹⁸ Annual reports of the Anatomical Cabinet, medical faculty and university 1851–78, AC2 270, AC2 271, AC2 272, AC2 273

⁹⁹ Annual reports of the Anatomical Cabinet, medical faculty and university 1851–78, AC2 270, AC2 271, AC2 272, AC2 273

¹⁰⁰ Annual report of the university 1857–58, AC2 271

¹⁰¹ Annual report of the medical faculty 1851–52, AC2 270; annual report of the university 1856–57, AC2 271

¹⁰² Molewater 1999, 81 (entry 30 September 1835)

The twins were still alive, but Molewater and the other students already knew they would end up in preparation jars within a few days or weeks at most. While the mother seemingly accepted their death ‘without any sorrow’ and the students who were promised the bodies possibly looked forward to it, Molewater struggled with the knowledge. He was neither the first nor the last medical student to have such feelings, but he would need to find a way to deal with them if he wanted to become a doctor. He would have to learn what has been variously called ‘dispassion’, ‘clinical detachment’, ‘detached concern’, ‘medical gaze’ and ‘necessary inhumanity’.

The last phrase, ‘necessary inhumanity’, was coined by William Hunter in a famous quotation from one of his lectures:

It is dissection alone that can teach us, where we may cut the living body, with freedom and dispatch; and where we may venture, with great circumspection and delicacy; and where we must not, upon any account, attempt it. This informs the head, gives dexterity to the hand, and familiarizes the heart with a sort of necessary inhumanity, the use of cutting instruments upon our fellow-creatures.¹⁰³

Hunter presents dissection as a way of learning the ‘necessary inhumanity’ good doctors need to do their job. Indeed, the dissection hall has often been pointed out as the place where students learn ‘dispassion’ or ‘detached concern’.¹⁰⁴ However, dissection in and of itself is something one needs to be eased into – something William Hunter was well aware of, as historian Lynda Payne has pointed out. She cites Hunter’s warning not to let students dissect unprepared, because this ‘might even create disgust to a study from which [they] ought to receive pleasure and advantage’.¹⁰⁵

The disgust that might result from dissection was twofold. Utrecht professor Cornelis Pruys van der Hoeven, who studied in Leiden, summarized the issue in a metaphor:

studying corpses, to which feelings and smell have to become inured, just as soldiers [have to become inured] to fire and gun smoke¹⁰⁶

Pruys van der Hoeven explains that students had to train two things: their smell and their feelings. This corresponds to two forms of disgust students had to overcome: material and moral. Material disgust is a direct, physical reaction to unpleasant, dirty – disgusting – smells or sights. Moral disgust is a struggle with the transgression of social norms. Primary sources sketch the disgusting elements of dissection in all their glory. Our London student Taylor, for example, wrote in November 1861:

Contrived to remove the intestines from my subject without letting out their contents, an accident that would have won for me the execration of all my fellow-students and perhaps have

¹⁰³ Hunter 1784, 67

¹⁰⁴ Not just in Hunter’s days, but ever since – see for example Good and Good 1993, 94–97 on the twentieth century.

¹⁰⁵ Hunter 1784, 108. See also Payne 2007, 111.

¹⁰⁶ Pruys van der Hoeven 1866, 16

subjected me to a reprimand from the Demonstrator of Anatomy for my carelessness or want of dexterity in the business.¹⁰⁷

The contents of a corpse's intestines typically cause material disgust. Moral disgust occurs when the student realizes he is actually cutting up another human being – not some 'object'. Taylor again:

Post-mortem examination of a remarkably fine and good-looking girl, who had died of typhoid fever. It made me feel quite sad to see her dead body lying on the post-mortem table, and I could not help but think, if she had a lover, how broken-hearted he must have felt at her untimely death.¹⁰⁸

Hyrtl vividly describes how hard it can be to overcome this disgust; to learn to work on the dead:

The uncommonness of anatomical practices, the cheerlessness of the surroundings, the seal of death that impresses every human being, [these three things] convince even insensitive people at their first visit to our mortuaries ... that anatomy possesses no aesthetic side. The first impression it makes on us is cold and serious; there is no cheerful muse greeting us on this gloomy threshold; it is the hand of death which waves us in. How many turn around each year, having looked around in this room [the dissection hall] for the first time, [this room] where only he can feel himself at home whose will [has] the power, whose inclination is profound, and whose selfishness is able to make the sacrifice which anatomy requires from each young person who devotes himself to its practice.¹⁰⁹

How did medical students prepare for the dissection hall, which, as Hyrtl put it, was 'no Eden'?¹¹⁰ Pruys van der Hoeven explained the practice in Leiden:

We too started early with human skeletons and human bones. This is how we were prepared for the study of corpses.¹¹¹

Handling preparations – bone preparations in this case – helped the students get used to the smell and the emotional impact of working with dead bodies. Leiden was not the only place where preparations were used to ease students into dissection: it was also one of Hunter's solutions. Payne has described how he let preparations circulate during his lectures to prepare students for dissection.¹¹² Like Robert Knox, Hunter did not fully trust his students: before handing them the preparations, he warned them not to press or bend them and informed them of his expectation that none of the preparations would be 'injured, or destroyed'.¹¹³ He also carefully instructed them on which part of the preparation to examine, which according to Payne helped reduce the potential impact of the preparations.

¹⁰⁷ Taylor 1927, 67 (entry 12 November 1861)

¹⁰⁸ Taylor 1927, 131 (entry 10 February 1863)

¹⁰⁹ Hyrtl 1865, 36–37

¹¹⁰ Hyrtl 1865, 12

¹¹¹ Pruys van der Hoeven 1866, 16

¹¹² Payne 2007, 111

¹¹³ Hunter 1784, 112

For although preparations may seem less disgusting than complete, decaying bodies, this is not necessarily the case. Preparations had to be carefully selected if used to help students overcome the disgust of dissection, because they can very well evoke that same disgust.

McLeary describes how many early twentieth-century American students disliked the demonstration of preparations because, as two of their teachers put it, ‘They are offensive alike to the senses of sight, smell and touch and only the brave or case-hardened person can profit by viewing them.’¹¹⁴ In addition to this material disgust, preparations can also cause moral disgust. This is particularly true for full body preparations – like Gunther von Hagens’ plastinates – and for preparations of body parts closely connected to human identity – like the head or, in our days, the brain.¹¹⁵

Not all preparations are less disgusting than dissection room corpses, but some of them are and these preparations helped students ease into dissection. Whether or not a preparation evoked disgust depended not solely on its subject matter, but also on the way it was made. Smelly, materially disgusting preparations could easily be avoided by employing proper techniques. Dry preparations in particular were a safe choice, which is probably why Pruys van der Hoeven’s teachers started with bones. Technique, or how a preparation is made, is also important when it comes to moral disgust. Marieke Hendriksen has shown that eighteenth-century Leiden anatomists considered it important to make their preparations as skilfully and elegantly as possible, because this was a way to deal with the disgust these objects might otherwise evoke.¹¹⁶ In this respect, mid-nineteenth-century Leiden professor Teunis Zaaijer did not differ from his predecessors. The following quotation is taken from his inaugural lecture:

Once an anatomist has at his command all means which are offered by technique, something that usually happens only after a lot of practice and effort; and if he is convinced of the necessity of an almost excessive care for purity and pulchritude, [then] an anatomical preparation becomes a painting in his hands, [a painting] on which he depicts the anatomical relations, and [*then*] he overcomes the disgust which anatomy has to evoke if it is practised in another way.¹¹⁷ (my italics)

Zaaijer acknowledged the fact that anatomy is likely to evoke abhorrence, but he thinks this abhorrence can be overcome when an anatomist carefully and with great skill creates a preparation. The preparation then becomes a ‘painting’ demonstrating knowledge about the body. These were also the preparations that could help students overcome the disgust they felt when first working with (parts of) dead people.

¹¹⁴ Robertson and Lundquist 1934, cited in McLeary 2001, 204

¹¹⁵ Hirschauer 2006; Hoskins 1989; Zwijnenberg 2011

¹¹⁶ Hendriksen 2012, 105–134

¹¹⁷ Zaaijer 1866, 23

Redissecting preparations in the laboratory

Molewater never entered a laboratory as a student, for the medical teaching laboratory was only born in the second half of the nineteenth century. In Leiden, the first one opened in 1865, shortly after the new physics and chemistry teaching laboratories were founded (1859), which were almost as important to medical students as the anatomy, pathology and physiology laboratories. Inside the laboratories, students were encouraged to do their own research, especially towards the end of their studies when writing their dissertations. In this research, they often used preparations – not only recent and freshly made ones (as mentioned above), but also old ones, which they redissected to answer their research question.

Preparations from the university's handling collections (and possibly also from the students' private collections) were used as empirical material. This was not only done by doctoral students, but also by 'real' researchers, who reinterpreted the preparations as new ideas found their way into medicine. This reinterpretation of older preparations will be discussed in more detail in the chapter on researchers.

One example of a preparation dissection by a student can be found in the dissertation of Hugo Heller. Heller, a student of Zaaïjer, wrote his dissertation on *hygroma colli cysticum congenitum*, a malformation of the neck. After he reviewed earlier discussions on the pathology, he turned his attention to an embryo from the Anatomical Cabinet that displayed this malformation. He described his examination of the preparation, which involved a redissection:

After making a cross incision through the skin only ... I loosened the skin with the four flaps so far as was necessary in order to see the boundaries of the tumour ... Under the chin is an opening in the septum, giving access to a hole which was originally covered by membrane ... which in the course of dissection came off together with the skin.¹¹⁸

Clearly, not much was left of the original preparation in the end, because Heller finally decided to open the chest as well as the tumour by 'splitting the tongue and lower jaw'.¹¹⁹

Heller's example is rather extreme given that he cut up the original preparation in its entirety. While he was by no means the only student working on preparations from the collections, most tended to leave at least part of the original preparations untouched. A survey of all dissertations listed in the most recent (and most complete) bibliographical work on Zaaïjer shows that nine out of ten named doctoral students worked with preparations.¹²⁰

¹¹⁸ Heller 1881, 33

¹¹⁹ Heller 1881, 36

¹²⁰ Wallé 2007, 176–177. As noted in the preface of this volume, the list of PhD students is by no means complete. This also follows from the fact that during Zaaïjer's professorship (1865–1902) 455 dissertations were produced in the medical faculty (Van Lieburg 1987, 12; Van Lieburg's numbers end in 1899, three years before Zaaïjer's death, meaning that the exact number was slightly higher than 455), and we have no reason to assume that Zaaïjer's share was much less than that of the other professors. (In 1865, the medical faculty had seven professors; in 1902, ten.) Yet, although the selection is small, the all-but-one score strongly suggests that a significant part of Zaaïjer's doctoral students engaged with anatomical preparations, either by redissecting old ones or by making new ones.

At least six of them used existing preparations in their research. In half of these cases, students used macroscopic preparations to make microscopic ones – something that also happened often in pathological anatomy dissertations written under the supervision of Zaaier's colleagues. Gerardus Couvée was one of the students who transformed (part of) a macroscopic preparation into a microscopic one.¹²¹ He wrote his dissertation in 1900, but worked on a big toe amputated in 1888 and stored in alcohol in the pathology laboratory ever since. The toe contained both a tumour and an interesting pigmentation. To investigate them, Couvée wrote, 'several pieces had been cut off the preparation hardened in alcohol'.¹²² Next, he coloured the pieces, after which they were ready for microscopic investigation.

In general, students working on microscopic preparations used fairly recent material – at most one or two decades old. Some students, however, also used much older preparations. For instance, W. Dominicus, Pieter Koning and Anne Leendert Erkelens researched skulls from the Anatomical Cabinet, including some of the skulls collected by eighteenth-century anatomists Sebald Justinus Brugmans (Dominicus and Koning) and Bernhard Siegfried Albinus (Erkelens).¹²³ Although they did not alter the skulls in any way, they re-examined and reinterpreted the skulls using new instruments and medical ideas, thereby showing that preparations were not solely intended to be looked at, but also to be handled.

Conclusion

Nineteenth-century medical students used anatomical collections in all of the teaching spaces they entered. In doing so, they used their hands: they removed preparations from their jars, they observed them with as many senses as possible, they made their own preparations and they redissected old ones. This helped them learn about the body, master anatomical techniques, answer research questions and overcome the disgust involved with dissection. Anatomical teaching collections have long been neglected in the history of medicine, and when they are discussed, most of the attention goes to museum collections used hands-off. Yet, to understand why they remained in use throughout the nineteenth century, we need to focus not on museum collections, but on handling collections. These collections fitted seamlessly with the new practical teaching, and students encountered them everywhere, from the lecture hall to the laboratory.

In Leiden, movability between the two types of collections was substantial: the university's largest collection, the one in the Anatomical Cabinet, basically doubled as both a display and a handling collection. In other spaces, the two types were more separated. In the Royal College of Surgeons in London, for example, only the store collections were

¹²¹ Other examples are Karel Haverkorn van Rijsewijk and Rodolphe Josselin de Jong, both students of Zaaier's colleague Siegenbeek van Heukelom, professor in pathological anatomy. Haverkorn van Rijsewijk 1900; Josselin de Jong 1895

¹²² Couvée 1900, 16

¹²³ Dominicus 1878; Erkelens 1902; Koning 1877

handled; preparations in the museum collection were intended to stay in the jar when used for teaching.¹²⁴

Whether intended for hands-on or hands-off use, there was a more fundamental distinction between display and handling collections. Even the preparations in display collections could be removed from their containers to facilitate observation. However, after removal, these were observed (either by eye or by hand) *as part of the museum display*. In the museum, the individual preparation, whether inside or outside the jar, gained its meaning from its place in the arrangement of the collection as a whole. McLeary writes:

The nineteenth-century medical museum aimed to demonstrate on its shelves the order of the human body and the diversity of disease. This aim was accomplished through complementary, interlocking means. The *physical arrangement* of the medical museum was intended to convey through its spatial arrangement medical knowledge about human (and sometimes comparative) anatomy and pathology. The *specimens* which were placed in this spatial arrangement were intended to provide the student with a simple and sure mechanism for acquiring and retaining knowledge, and the museum as a whole was meant to provide a sensory experience that would stimulate the mind and communicate knowledge more surely to the student than lectures, books, or pictures.¹²⁵

Display collections were arranged according to a certain classification on the shelves in a museum, so that students could carefully observe them as part of this order. Handling collections were also arranged according to a certain classification; sometimes even the same classification as used in the museum. However, when handling collections were used, individual preparations were taken out of the classification and transported to another learning space. The arrangement of the collections was not part of the teaching practice in which these collections were used. When the parts of these collections (the individual preparations) were used, they were separated from the whole both spatially and intellectually. The ‘whole’ was *not* the reason the preparations in handling collections had been collected, as opposed to the preparations in display collections.

Preparations in handling collections were collected and kept for more prosaic reasons than creating a whole that was more than the sum of its parts. These reasons concerned the practical problems of anatomical research and teaching. Anatomy – whether general, descriptive, pathological, topographical, comparative, microscopic, early modern, nineteenth-century or present-day – is about bodies. Working with bodies comes with two major practical limitations. First, bodies decay more quickly than they can be dissected. Second, they are scarce and their arrival is unpredictable. Bodies cannot be ordered, at least

¹²⁴ Richard Owen, ‘Report to the Board of Curators of the Museum of the Royal College of Surgeons On the Museum d’Anatomie Comparée in the Garden of Plants, Paris’, September 1831, RCSE MS0025/1/4/1, 1, p. 6–8

¹²⁵ McLeary 2001, 29

not the human ones (with obscure exceptions like the Burke and Hare murders);¹²⁶ animal bodies are often easier to come by, as long as the animal you are after is not too exotic.

Anyone teaching or researching anatomy has to find a way to overcome decay and make bodies available evenly over time. A common solution is to preserve the material when it comes available and to store it somewhere safe for future use. This is still done: in Leiden's anatomy skills lab – as the present-day dissection hall is called – students work with bodies that are often several years old. Preserving tissue (as microscopic slides, as a complete body, or as something in between) is a necessary step in researching and learning about the body: it is the only way to assure the availability of empirical material when you need it. When the pieces of preserved material – the preparations – are stored together, a collection is born. Making and collecting anatomical preparations should therefore not only be seen as an end in itself, but also as a means to overcome the limited availability and quick decay of human and (to a lesser extent) animal bodies – to 'alter time's ... movement', as Harold Cook has put it.¹²⁷ With display collections it is an end; with handling collections it is a means.

The difference between collecting as a means and collecting as an end, between a focus on the parts and a focus on the whole, is not only relevant when looking at the use of anatomical collections in learning and teaching, but also when looking at the use of these collections in research – to which we now turn.

¹²⁶ Rosner 2010

¹²⁷ Cook 2002, 241