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Author(s): Lucia Dacome and Renata Peters
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FABRICATING THE BODY: THE ANATOMICAL MACHINES OF THE PRINCE OF SANSEVERO

Lucia Dacome and Renata Peters

Abstract

The so-called anatomical machines of the Prince of Sansevero, on display at the Museo Capella Sansevero in Naples, are two anatomical models, of a man and a woman, which depict the system of blood vessels in the human body. They were made by the anatomist Giuseppe Salerno in the mid-18th century and presented as the result of anatomical preparations based on a technique known as “anatomical injection” (injection of embalming substances in cadavers).

Sansevero’s anatomical machines have gradually become the subject of a legend, according to which the models were the outcome of an operation of human vivisection in which a woman and a man were killed through the injection of embalming substances in their blood vessels. Due to lack of written documentation on the early history of the anatomical machines, controversy continues about how they were actually made. This project tried to address this controversy by combining examination and instrumental analysis of their raw materials and manufacturing techniques with historic research. The conclusions of this study contradict the content of the well-known legend and raise questions about the nature of these objects as products of anatomical injection. More importantly, they also allow the re-telling of the story of the anatomical machines and offer an insight into the world where the legends surrounding Sansevero and the models were originated.

1. Introduction

The so-called anatomical machines of Raimondo di Sangro, Prince of Sansevero (1710-1771), are two anatomical models, of a man and a woman, which represent the system of blood vessels of the human body (Figs. 1, 2 and 3). Still surviving today, they were manufactured by the anatomist Giuseppe Salerno in the mid-18th century and were originally displayed as part of the cabinet of curiosities of Raimondo di Sangro, an eighteenth-century Neapolitan nobleman, military man, savant, and writer, who contrived curious objects and mechanical devices, and displayed them in his Palace. As a natural inquirer, di Sangro engaged in correspondence with savants in other parts of Europe; in a series of letters published in the 1750s he claimed, for example, to have found a source of eternal light on the basis of his experimental pursuits (di Sangro 1753a, di Sangro 1753b, de Sangro 1991). Di Sangro also claimed to have contrived special materials such as waterproof fabric, vegetable silk, vegetable wax and artificial blood, and to have used some of these materials in the creation of objects for his cabinet and in the decoration of the Sansevero Chapel (Cioffi 1994). Di Sangro’s cabinet and chapel (Fig. 4) became Grand Tour attractions and were regularly visited by travellers. In 1766, they were described in the booklet “Breve nota di quel che si vede in casa di Raimondo di Sangro, Principe di Sansevero” (Anon. 2001), a text believed to have been authored by di Sangro himself, which introduced visitors to the curiosities one could see in the Sansevero Palace. The two anatomical
machines are the only objects of the cabinet known to still exist today.

Fig. 1. The female anatomical model. (All photos by R. Peters except as noted).  
Fig. 2. The male anatomical model.
Fig. 3. The male and female models on display at the lower level of the Sansevero Chapel and Museum (Renata Peters in the middle). Photo by L. Dacome.

Fig. 4. The Chapel of Sansevero, also known as Santa Maria della Pietà.
Historical documentation on the manufacture of the anatomical machines is scarce. In the few 18th century sources that have survived to this day, the anatomical machines are presented as anatomical preparations based on “injection”, an embalming technique (believed to be based on injecting cadavers with a mixture of waxes, solvents and other materials) that allowed visualizing inner bodily parts. Perfected in the late 17th century by Dutch anatomists such as Reinier de Graaf, Frederik Ruysch, and Jan Swammerdam, the technique of anatomical injection was regarded as a particularly promising means for investigating the inner body and an invaluable source of medical knowledge based on visualization (Cole 1921, Cook 2007).

The history of the manufacture and early viewing of the anatomical machines may easily be placed in this context. Created by an anatomist and displayed in the cabinet of curiosities of a savant, these anatomical objects testify to the intersection between 18th century anatomical pursuits, experimental cultures, and practices of collecting and displaying. Yet this is only one aspect of these objects’ peculiar histories. By the end of the 19th century, the origin of the anatomical machines became the subject of a legend in which they were taken to be the result of the injection of embalming substances into two of di Sangro’s servants while they were still alive (Croce 1923). In 1894, the essayist Fabio Colonna di Stigliano reported about the legend in a prestigious periodical on Neapolitan monuments and arts, “Napoli nobilissima”, where he wrote that he had gathered the story in the streets and alleys of Naples (di Stigliano 1894, Croce 1923). Lack of documentation on the raw materials and manufacturing techniques of the anatomical machines has made it difficult to appraise how the models were actually made. This shortage has, in turn, created a fertile ground for the spreading of the legend, which survives to this day.

This paper discusses some aspects of the manufacturing techniques and raw materials of these two anatomical models and the impact that lack of historical memory of these processes may have made on the history of the models as well as on the biography of the Prince of Sansevero himself. Investigation into the raw materials and manufacturing techniques of the anatomical machines took place in tandem with historic research on the activities of the Prince of Sansevero. The social-historic aspects of the research informed the examination and instrumental analysis of the pieces, and vice-versa. The integration of these two approaches posed new questions, and opened up the way to a more informed understanding of the material fabric of the models and the context in which they were created.

As it will be shown below, the conclusions drawn from this study contradict a well-known legend and raise questions about the “authenticity” of these objects as products of anatomical injection. More importantly perhaps, these conclusions provide new insights into the history of these anatomical models.

2. Viewing the inner body

The history of anatomical models dates back well before the 18th century. A long-standing tradition of votive objects invoking or acknowledging divine intervention in the cure of serious diseases and injuries found expression in the offering of anatomical models of the affected bodily parts. Since the Renaissance, anatomical models also started to appear in artistic ateliers and in the cabinets of physicians and surgeons as tools that helped both artists and medical practitioners
to study the proportions of the human body. In the course of the 18th century the practice of anatomical modeling reached a high point of production and dissemination thanks also to the patronage of a number of European sovereigns, including Peter the Great of Russia, pope Benedict XIV, the Grand Duke of Tuscany Peter Leopold and his brother the Holy Emperor Joseph II, who sponsored the creation and displays of anatomical collections. By the end of the 18th century, anatomical models could be found in a variety of venues, including museums, natural history and medical cabinets, workshops, academies, universities and medical and midwifery schools. They were used in the training of medical students, midwives and artists, and came to be regarded as an effective method of anatomical teaching that could spare students the problems associated with the dissection of cadavers (e.g. deterioration, smell or risk of contamination). In addition, models revealed the wondrous complexity of the human body, and enticed the curiosity of increasingly larger audiences of lay viewers. Along with anatomical models made out of different materials, such as wax, wood, clay and plaster, 18th century anatomical collections often also included anatomical preparations of embalmed bodily parts (Haviland and Parish 1970, Lemire 1990, Düring et al 1999).

By the time the anatomical machines appeared in the cabinet of curiosities of the Prince of Sansevero, anatomical preparations based on injection had come to be regarded as a particularly effective means for investigating the inner body and revealing otherwise invisible bodily parts. As such they had raised the expectation that it was possible to visualize the circulatory system and chart the human body in an unprecedented way. In 1784, the British anatomist William Hunter emphasized this expectation by saying that “filling the vascular system with a bright colored wax, enables us to trace the large vessels with great ease, renders the smaller much more conspicuous, and makes thousands of the very minute ones visible, which from their delicacy, and the transparency of their natural contents, are otherwise imperceptible” (Hunter 1784, 56).

3. The impact of the Machines

By displaying a complex web of blood vessels, di Sangro’s anatomical machines substantiated a remarkable instance of this process of unveiling the “invisible”. In 1766, “Breve nota di quel che si vede in casa di Raimondo di Sangro, Principe di Sansevero” presented them as unique objects because they displayed whole bodies and were crafted with special diligence. However, almost a century and a half later, Colonna di Stigliano described them as a “macabre and dreadful sight” characterized by a “dreadful entanglement of veins and arteries that stimulated in the viewer the greatest marvel” (di Stigliano 1894, 121 and 154).

Speculations on the origin of the anatomical machines have proliferated since the publication of Colonna di Stigliano’s article. The anatomical machines have been interpreted, re-interpreted and situated in ever new contexts. Over the years, they have accordingly appeared in a variety of publications ranging from newspaper articles to comic books, from surrealist periodicals to esoteric publications and horror websites.

In 1964, the female anatomical machine appeared on the cover of an issue of the French periodical “La Brèche, Action Surréaliste”, an irreverent surrealist periodical edited by André Breton among others. In a celebratory article by Paule Thévenin, which questions the reliability
of the legend, di Sangro is portrayed as a man of insatiable curiosity and free thinking, a “savant impenitent” (an unrepentant savant) and “intrepid discoverer”. The anatomical machines, on the other hand, are described as the outcome of “injection”, and an expression of Sansevero’s inventive genius (Thévenin 1964, 15).

Some twenty years later, the anatomical machines made their entry in the world of comic books, when they became the main characters of an issue of the Italian publication Martin Mystère, titled “Il Principe delle Tenebre” (Castelli and Alessandrini 1985). The comic series describes the adventures of Martin Mystère, also known as “Detective of the Impossible”. In “Il Principe delle Tenebre” the anatomical machines are unearthed during the excavations of Sansevero’s old laboratory. They are then resuscitated, their DNA is cloned and they are replicated and turned into villains whom Martin Mystère, a very resourceful hero, has to confront.

The legend has continued to circulate across the media and on 18 October 1996, for instance, the journalist Rino di Stefano published an article on the Prince of Sansevero titled “Il principe maledetto”, in which the legend was presented for readers of the Italian newspaper “Il Giornale” (di Stefano1996).

“The leyenda del Príncipe Alquimista”, a book written by Pierdomenico Baccalario (2002), presents a different angle. When in disagreement with the headmaster of their school, the main characters, Darío y Fiammetta, are told the story of Raimondo di Sangro’s struggles and pursuits. Di Sangro is portrayed in a redeeming light and described as a misunderstood man who was ahead of his time.

The advent of the internet has opened up new venues for the dissemination of the legend. A search on “Raimondo di Sangro” on the popular Google search engine (Google 2007) returned 79,000 entries. The content of the first 30 entries ranges mainly from esoteric to horror-related topics where the legend of the anatomical machines is often narrated with macabre overtones. Di Stefano’s own article is available on the web both in Italian and in English under the title “Raimondo di Sangro, the ‘Sorcerer’ Prince” (di Stefano 1996).

The above is only a sample of the attention the anatomical machines have attracted over time and the different reactions they have provoked. Perhaps also due to this conspicuous presence in the media, the anatomical machines have become again a regular sightseeing for tourists visiting Naples today.

4. Manufacturing techniques and raw materials

The heirs of Sansevero and current owners of the Sansevero Chapel hold all rights relating to the anatomical machines. Authorization for examination and sampling was kindly granted after detailed negotiations and the submission of a comprehensive work plan. Unfortunately, the amount of time for examination and the extent of sampling granted were quite limited, and thus the results of this study are only partial. Nonetheless, it suffices to determine the nature of the materials of the anatomical machines and their manufacturing techniques.
The models show a complex and delicate network of arteries, veins and capillaries of different thicknesses, colors and lengths. They are about 160 cm tall, the female is slightly taller. The male figure is mounted directly onto the wall. There are two lead alloy braces above each knee (Fig. 5), hooks drilled into each tibia and a large screw placed into the occipital bone of the cranium (Fig. 6). The female is mounted onto a plinth, attached to it from the feet (Fig. 7).

Fig. 5. Lead alloy braces help hold the male model onto the wall.

Fig. 6. There is a large screw placed into the occipital bone of the cranium of the male model.
The bones of the models are held together with metal pins, nails and wires (Figs. 8 and 9). Most of the bones are present in both figures but many of them seem either very or slightly out of place, suggesting that they may have been moved in the past. Some of the vital organs are

Fig. 7. The female is mounted onto a plinth, attached to it from the feet.

Fig. 8. The bones are held together with metal pins, nails and wires (see metal pin placed into the head of the humerus).
present but also seem misplaced. Although the organs were not sampled, visual examination suggests they may have been made with a core of wood which was coated with wax (Fig. 10). The enlarged aspect of the area where the uterus would have been suggests that the woman may have died either while or after giving birth (Fig. 11). No pubic symphysis (cartilaginous joint) could be seen between the pubic bones (Fig. 12).

Fig. 9. Wires and cables hold the bones in place.

Fig. 10. Visual examination of the organs suggests they may have been made with a core of wood which was coated with pigmented wax.
The crania were sawn open and copper alloy hinges were placed on either side (Fig. 13) so that the complex network of blood vessels present in the cranial cavity could be inspected. The

Fig. 11. The enlarged appearance of the area where the uterus would have been suggests that the woman may have died either while or after giving birth.

Fig. 12. No pubic symphysis (cartilaginous joint) could be seen between the pubic bones.
possibility of handling, opening and disassembling anatomical models was a frequent feature of their function as educational objects. The male has only 16 teeth, some with longitudinal cracks (Fig. 14). They seem to have been cut, sawed or sanded. It is not known when or whether the missing teeth were pulled out. The outer surface of the male’s cranium is clean, the female’s cranium, on the other hand, is covered with blood vessels (Fig. 15) and she has most of her teeth present.

Fig. 13. The crania were sawn open so that the complex network of blood vessels present in the cranial cavity could be inspected.

Fig. 14. The male has only 16 teeth; some have longitudinal cracks.
The feet of the male figure are missing (Fig. 16), so is one of his testicles and the fetus that used to lie by the female’s feet. The female’s structure is much sounder than the male model’s and her general appearance is more organized. However, they seem to have been made following the same techniques and using the same materials.
Vessels from the two models were sampled in different areas. Altogether, 12 samples (from 3 mm to 30 mm long) were taken, 4 of them were already disassociated from the models. No material was collected from the organs or arteries due to their large dimensions and conspicuous locations. All samples were examined using transmitted and polarized light microscopy, scanning electron microscopy (SEM) and Fourier transform infrared spectroscopy (FTIR). The results of these analyses show that the studied vessels have a core made out of a metal wire twisted with fibres, and coated with a mixture of pigmented waxes (Figs. 17 and 18).

Fig. 17. Some of the 12 studied samples. The results show that the studied vessels have a core made out of a metal wire twisted with fibers, and coated with a mixture of pigmented waxes.

Fig. 18. Core of some of the studied samples, after having the wax layer scraped off.
SEM analysis revealed that the metal wire is made out of an iron alloy. Transmitted and polarized light microscopy identified the fibers (twisted with the iron wire), as silk. FTIR analysis was used to study the wax. The resulting spectra showed it to be consistent with characteristics of beeswax. Interestingly but unsurprisingly, historic research showed that these materials were commonly used by modelers of the 17th and 18th centuries (Archivio di Stato di Bologna 1732, Archivio di Stato di Bologna 1742, Haviland and Parish 1970, Lemire 1990).

This study did not uncover any evidence to indicate that the anatomical machines were made following the techniques of injection. No evidence was found to indicate that the vessels of the cadavers used to make the so-called anatomical machines were injected with embalming substances.

On the contrary, all the evidence uncovered indicates that the circulatory system depicted on the anatomical machines was artificially fabricated with waxes, an iron wire and silk fibers, probably following techniques commonly used by anatomists of that time (Archivio di Stato di Bologna 1732, Archivio di Stato di Bologna 1742).

5. Conclusions

Di Sangro’s anatomical machines seem to have an undeniable capacity to evoke a codified imagery of dread and death. Arguably, their ghastly looks may have contributed to raise the curiosity and imagination of viewers. At the same time, lack of knowledge about their origins and manufacturing techniques has seemingly created a propitious ground for the development of a legend that situates them in the contexts of the narratives about human vivisection and the controversial handling of cadavers that has accompanied the history of anatomical practice. The anatomical machines provide a particularly interesting case study for exploring both the history of anatomical objects and the complex web of relations that are inscribed in historical artifacts. Having taken on different meanings at different times, and having been appropriated and reinterpreted in a variety of different arenas (as medical specimens, horror creations, mythical objects, curiosities, educational tools, etc), these anatomical objects offer a unique point of entry into the study and historical reconstruction of the ‘life of things’. The idea that things have a life of their own and as such may become subjects of biographical writing is not new. As Igor Kopytoff has put it (1986, 66), we may ask objects similar questions to those one asks in relation to people’s biographies. In order to understand ‘the life of things’, we need to consider their origins, origins, status, uses and careers in different times, cultural markers, changes caused by age and end of usefulness. Similarly, we need to understand the various phases of their existence, the impact the environment and social factors had on their lives, and their changing relationships with people.

By investigating the manufacturing techniques of the anatomical machines, this research has aimed at contributing to their biography. In the absence of appropriate documentary evidence, examination and instrumental analysis informed the understanding of material fabric of the models and allowed us to step back from the legend that has developed around di Sangro’s anatomical machines.
Furthermore, this study may also inform the conservation of similar anatomical models. Likewise, it may be useful in the discussions on the notions of authenticity and fabrications, and how those are affected by people’s perceptions and beliefs. All the controversy that has surrounded the Turin Shroud illustrates how hard it is to predict how collective imagery evolves (Hedges 1997). The different studies that have been carried out to assert the exact date of the origin of the shroud have done little to affect the faith some people have in it. In some ways, these studies have even been incorporated into the way the shroud is perceived. Similarly, the recent revelation that some of the material believed to be the relics of Joan of Arc may in fact have been made from the remains of an Egyptian mummy (Butler 2007) also has the potential to cause further debate about the relationship between notions of authenticity and the perception of historically charged objects.

Although the conclusions drawn from this study are at variance with the content of the legend developed around the anatomical machines, our aim has not been to set it aside. Rather, the process of investigation has made it possible to revisit the legend in light of the variety of interpretations and re-appropriations that have characterized the life of these anatomical models. By drawing attention to the complex historical interplay between texts, oral traditions and artifacts, this study enriches our understanding of the history of anatomical models, their place in the material culture of medicine and their role as sources of knowledge.

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Authors’ Addresses

Please address all correspondence to Ms. Peters.

Lucia Dacome, Institute for the History and Philosophy of Science and Technology, 91 Charles St., West, Victoria College, University of Toronto, Toronto, Ontario, Canada M5S 1K7

Renata Peters, Institute of Archaeology, University College London, 31-34 Gordon Square, London WC1H 0PY (m.peters@ucl.ac.uk). Please address all correspondence to R. Peters.